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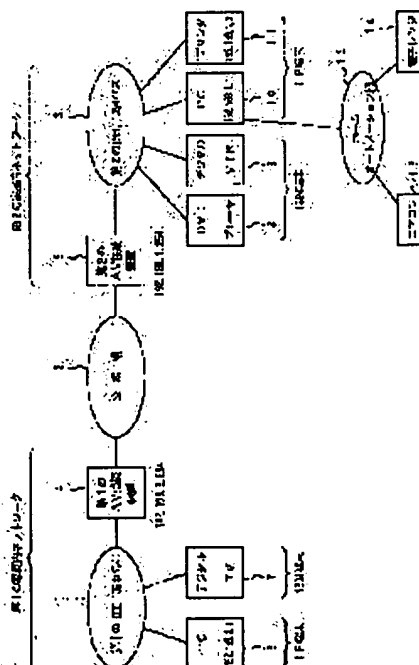
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(54) COMMUNICATION EQUIPMENT, COMMUNICATING CONTROLLING METHOD, SERVICE REGISTERING METHOD, SERVICE PROVIDING METHOD AND EQUIPMENT CONTROLLING PROGRAM REGISTERING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a unified service providing environment independent of a specific network by dynamically describing information concerning a service moving on communication equipment in a configuration information storing means.

SOLUTION: A first AV connector 4, a PC 6 and a digital TV 7 are connected to a first IEEE 1394 bus 1. A second AV connector 5, a DVD player 8, a digital VTR 9, a PC 10 and a printer 11 are connected to a second IEEE 1394 bus 3. Then, another node communicated through communication equipment (PC 6 and 10) can timely recognize an application which the PC 6 and 10 serve at a point of time by accessing to a configuration information storing means. Especially when an operating service dynamically varies, the dynamic variation of the operation of a service becomes more intense, therefore effectiveness of dynamically varying service configuration information becomes significant.



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CLAIMS

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## [Claim(s)]

[Claim 1] The communication device which is a communication device equipped with the means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means to memorize the configuration information about self-equipment, and is characterized by describing dynamically the information about the service which works on self-equipment for said configuration information storage means.

[Claim 2] The communication device which is a communication device equipped with the means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means to memorize the configuration information about self-equipment, and is characterized by describing collectively the information about the service which works on self-equipment, and the information about the attribute of self-equipment for said configuration information storage means.

[Claim 3] The communication device which is a communication device equipped with the 1st means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means to memorize the configuration information about self-equipment, and is characterized by describing a part of configuration information [ at least ] about the network connected to self-equipment through the 2nd different means of communications from said 1st means of communications for said configuration information storage means.

[Claim 4] The communication device which is a communication device which registers service into the directory agent who exists in the connected network, and is characterized by having a means to register the service of an electronic device which communicates with the protocol depending on the data link of said connected network into said directory agent instead of this electronic device.

[Claim 5] The communication device which is a communication device which notifies the information about service according to the inquiry from the user agent in the connected network, and is characterized by having a means to notify said user agent of the service of an electronic device which communicates with the protocol depending on the data link of said connected network instead of this electronic device.

[Claim 6] The communication device according to claim 4 or 5 characterized by registering or notifying the logic multiplex identifier of self-equipment as a port for access to said service registered or notified in the case of advice to the registration to said directory agent, or said user agent.

[Claim 7] The communication device according to claim 6 characterized by changing into the command of the protocol which depends for this command on said data link corresponding to it, and transmitting to said electronic device when a command arrives at the port specified by said logic multiplex identifier.

[Claim 8] The communication device according to claim 6 characterized by having a response table for mapping to the command of the protocol which depends on said data link corresponding to this command for the command which arrived at the port of said logic multiplex identifier.

[Claim 9] If it cannot communicate if the 1st means of communications is followed, but the 2nd means of communications is followed, the electronic device which can communicate, It is the service registration approach in the communication device connected to the network where the electronic device which can communicate may be connected even if it follows any of the 1st means of communications and the 2nd means of communications. With the electronic device with which registration of the information about the service offered from said each of electronic device through said 1st means of communications was received, and existence has been recognized by said 2nd means of communications and said 1st means of communications about a thing without said advice which leads The information about the service offered by this each of electronic device that should be registered is acquired using said 2nd means of communications. The service registration approach characterized by constituting the service directory information on said network based on the information about said notified service, and the information about said acquired service.

[Claim 10] It is the service provision approach in the communication device to which at least one electronic device which can communicate was connected when it could not communicate when following the 1st protocol, but following the 2nd protocol. The logic multiplex identifier of self-equipment which follows said 1st protocol as a port for access to the service offered by said electronic device is assigned. The service provision approach characterized by changing this command into the command according to said 2nd protocol, and transmitting to said electronic device when a command arrives at the port specified by said logic multiplex identifier.

[Claim 11] The means of communications which operates the register by which the map was carried out to single-address space, An acquisition means by which the attribute information on the electronic device recognized by said means of communications comes to hand, Registration of the device control program which controls said electronic device by publishing the directions which operate the register on said single-address space to said means of communications The communication device characterized by having the registration means performed working based on the attribute information on said electronic device which came to hand.

[Claim 12] Said registration means is a communication device according to claim 11 characterized by having a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand with said acquisition means, and a means by which the corresponding device control program comes to hand based on said identifier searched for.

[Claim 13] It is the communication device according to claim 11 or 12 which the attribute information on said electronic device is described by the configuration information storage region where it was beforehand set in said electronic device, and is characterized by said acquisition means receiving said attribute information by reading the content described by said configuration information storage region.

[Claim 14] Said single-address space is a communication device given in claim 11 characterized by being provided in the form of an IEEE1394 bus thru/or any 1 term of 13.

[Claim 15] A communication device given in claim 12 characterized by using the identifier which can direct the specific resource of an external network as an identifier of said device control program thru/or any 1 term of 14.

[Claim 16] The communication link between a predetermined electronic device and other communication devices which can be communicated with a means to operate the register by which the map was carried out to single-address space the means of communications using a logic network -- a possible communication device -- it is -- said means of communications -- leading -- said -- others -- with a means to require acquisition of the attribute information on said electronic device from a communication device A means to perform registration of the device control program which controls said electronic device working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand, said -- others -- the communication device characterized by having a means to transmit and receive the information about the directions which operate the register on said single-address space through said means of communications between communication devices.

[Claim 17] It is the device control program registration approach of registering a device control program working [ a communication device ]. The attribute information on the electronic device recognized by the predetermined means of communications which operates the register by which the map was carried out to single-address space comes to hand. Registration of the device control program which controls said electronic device by publishing the directions which operate the register on said single-address space to said means of communications The device control program registration approach characterized by carrying out working based on the attribute information on said electronic device which came to hand.

[Claim 18] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network Said 2nd network is minded for the information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment at least. An offer means to provide, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, The communication device characterized by providing the control means which changes into said 1st command the 2nd command contained in the message received with this receiving means, and controls said service provision equipment by this 1st command.

[Claim 19] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, The information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with



this collection means An offer means to provide through said 2nd network at least, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, The communication device characterized by providing the control means which changes into said 1st command the 2nd command contained in the message received with this receiving means, and controls said service provision equipment by this 1st command.

[Claim 20] The communication device according to claim 19 characterized by acquiring the information about the 2nd command corresponding to the information about the service which possessed the table which registered said 2nd command corresponding to said 1st command which said service provision equipment offers, and which was beforehand defined for every service, and were collected with said collection means from this table.

[Claim 21] The communication device according to claim 18 or 19 characterized by changing into said 1st command the 2nd command which possessed the response table of said 1st command and said 2nd command, and was received with said receiving means with reference to this response table.

[Claim 22] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, The communication device characterized by providing the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means.

[Claim 23] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, The communication device characterized by providing the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means.

[Claim 24] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, A creation means to create the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment based on the information about the service collected with this collection means, An offer means to offer the homepage created with this creation means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, The communication device characterized by providing the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means.

[Claim 25] The table which registered the 2nd command depending on the communications protocol of said 2nd network for controlling this service provision equipment corresponding to said 1st command which said service provision equipment offers, and which was beforehand defined for every service is provided. The communication device according to claim 23 or 24 characterized by acquiring the information about the 2nd command corresponding to the information about the service collected with said collection means from this table, and creating said homepage.

[Claim 26] Said control means is the communication device of any one publication of claim 22-24 characterized by changing into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command including the 2nd command depending on the communications protocol of said 2nd network for said message to control said service provision equipment.

[Claim 27] The 2nd command depending on the communications protocol of said 2nd network for said message to control said service provision equipment, The address depending on the communications protocol of said 2nd network and the multiplex identifier for specifying said service provision equipment depending on said 1st network are included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command. The communication device of any one publication of claim 22-24 characterized by controlling the

service provision equipment identified in said multiplex identifier by this 1st command.

[Claim 28] Said homepage includes the program for generating the message containing the 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command. The communication device of any one publication of claim 22-24 characterized by controlling service provision equipment by this 1st command.

[Claim 29] Said control means is the communication device of any one publication of claim 22-24 characterized by starting the program for publishing said 1st command by the message received with said receiving means.

[Claim 30] Claims 18 and 19 characterized by including the information which specifies the communications protocol at the time of transmitting information as said message, 22 and 23, and the communication device of any one publication of 24.

[Claim 31] Said 1st network is the communication device of claims 18 and 19 characterized by being IEEE1394, 22 and 23, and any one publication of 24.

[Claim 32] Said 1st network is the communication device of claims 18 and 19 characterized by being LON (Local Operating Network), 22 and 23, and any one publication of 24.

[Claim 33] In the communications control approach for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network The information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment is offered through said 2nd network at least. The communications control approach characterized by changing into said 1st command the 2nd command contained in this message, and controlling said service provision equipment when the message containing this 2nd offered command is received through said 2nd network.

[Claim 34] In the communications control approach for controlling the service provision equipment which communicates with the protocol for which connects to the 1st network and it depends on this 1st network through the 2nd network The information about the service which said service provision equipment offers is collected. The homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment is created. When this homepage is offered through said 2nd network and the message based on this offered homepage is received through said 2nd network, The communications control approach characterized by controlling said service provision equipment by said 1st command published based on this message.

[Claim 35] It is the communication device connected to the 1st network and 2nd network. The 2nd logic multiplex identifier is assigned to the service offered by the 1st logic multiplex identifier of the equipment of the arbitration on said 1st network. The 1st [ said ] logic multiplex identifier and the 1st address of the equipment on the 1st [ said ] network which offers the service, A storage means to memorize the response relation between the 2nd accessible address and said 2nd logic multiplex identifier from said 2nd network, A presentation means to show as service which can access each service of said 1st logic multiplex identifier by said 2nd address and said 2nd logic multiplex identifier from said 2nd network, The communication device characterized by performing the packet transfer for offering the service on the 1st [ said ] network shown with said presentation means between said 1st and 2nd networks based on the response relation memorized by said storage means.

[Claim 36] The communication device according to claim 35 characterized by providing further a collection means to collect the 1st addresses of the equipment which offers said 1st logic multiplex identifier and each service on said 1st network.

[Claim 37] The communication device according to claim 35 characterized by providing an output means to output only the packet which has the identifier memorized by said storage means to said 1st network among the packets inputted as the 2nd storage means which memorizes the identifier of the packet which can be transmitted to said 1st network among the packets inputted from said 2nd network from said 2nd network.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the communications control approach performed by a communication device and these communication devices, such as a computer which may control communication devices, such as a computer equipped with the function which controls remote operation of the directory service in a home network environment, and a device, or a peripheral device, especially the various equipments connected to the general-purpose bus, the service registration approach, the service provision approach, and the device control program registration approach.

[0002]

[Description of the Prior Art] (1) Digitization of electronic equipment is advancing quickly so that development of a multimedia technique may be symbolic in recent years. This inclination has started in office environment first. In the field of hardware, it is going on in the form of installation of a personal computer, digitizations of OA equipment, and those networks. In the field of software, the Internet applications, such as software, such as basic operation (rightsizing of this is carried out and it is shifting to a personal computer etc.) by the host, and a word processor, a spreadsheet, or WWW, etc. are introduced. And Field of application of digitization is circulated increasingly and the development does not know the place which remains.

[0003] The above-mentioned inclination is seen also in the device used by domestic, its related field, etc. That is, digitizations, such as installation of Internet accesses, such as digitizations (namely, DVD, digital VTR, a digital camcorder, etc.) of an AV equipment, digitization of broadcast, and OCN, etc., are advancing steadily.

[0004] The wave of the promoted above technological innovation including office environment can consider going towards a network from now on. That is, the technique of various fields, such as information, a communication link, and broadcast, is bundled by digitization, and it is said that exchange is begun by network.

[0005] As a network technique used as the base for realizing this, it thinks of various candidates. For example, Ethernet has an overwhelming track record in office environment, and it can be said also in the personal computer network in a home that he is the leading candidate. Moreover, ATM is also a strong candidate. This is because it is a general motion that the construction sides (telephone company, CATV, etc.) of an infrastructure will build an infrastructure using this technique paying attention to the description of ATM, such as a high speed, real time, and a broadband.

[0006] these candidates -- in addition, recently -- IEEE1394 -- the network technique (bus technique) attracts attention. This has the description which should observe many, such as a high speed, real time (QOS guarantee), and plug and play, and attracts attention serious as a leading candidate of the connection type of digital AV equipments especially in the AV equipment industrial world. Moreover, the attentions to this technique are beginning to gather also in the computer industrial worlds, such as a personal computer.

[0007] Now, exchange by the network of information, a communication link, broadcast, etc. will be first realized with the spread of the digital instruments for homes by interconnecting these digital instruments with the network technique for which a user asks. It is thought that it is made such and the prototype of a domestic digital network is produced gradually.

[0008] And it is thought that the needs to connect these digital networks mutually actualize as the next phase. For example, they are the needs that the AV equipment connected to 1394 networks of the drawing room of the first floor of user \*\* and the AV equipment connected to 1394 networks of the chamber of the second floor will be interconnected, for example, dubbing etc. will carry out coordination actuation. Or it is a case so that coordination actuation of the device a connected to 1394 networks of user A \*\* and the device b connected to 1394 networks of user B \*\* may be carried out.

[0009] However, in order to realize interconnect of domestic or the digital networks between homes, there are the following problems.

[0010] (i) When saying that the device through a network will be controlled between domestic or a home, the device for getting to know the information "what kind of service is offered on the network" offer [ "what device to be in which location on a network" or ] Taken does not exist. Unless this device exists, a user cannot recognize existence of specific device/service on a network, and cannot perform actuation or control of an object device, or cannot receive offer of service.

[0011] (ii) Although it is assumed that the part according to a different protocol in interconnect of digital networks is intermingled, the device in which an actuation command etc. is told exceeding a different protocol does not exist.

[0012] For example, when IEEE1394 is used, an Internet-compatible device etc. is able to be intermingled other than the device corresponding to 1394, and the protocol used is not necessarily in agreement. When it is going to operate by remote control in such a mixture situation (i.e., when it is going to control an object device through the network of a different classification), since an IEEE1394 protocol cannot be worked, sending of an actuation command is impossible in the network of a different classification.

[0013] Moreover, although the method of preparing Gateway and realizing remote operation etc. is also considered, the design manual of the Gateway which can be set in such a case etc. does not exist. [0014] In (2) and time, with the spread of rapid personal computers in recent years, and diversification of application, the peripheral device is diversified to storage equipment like a hard disk, a scanner, an input unit like a camera, etc., and the class is continuing increasing.

[0015] In the past, there was no versatility of both application software and peripheral-device hardware, and the peripheral device could be used only from specific application and had inconvenient [ which cannot be used from others ]. this failure is remarkable mainly by the following three techniques current -- the partial dissolution is carried out. The technique is the software called the driver which absorbs the difference in control of hardware, the technique of the loader, bull driver which can read a driver if needed and can be included in an operating system (hereafter referred to as OS), and a technique of the plug and play which the computer itself detects the connected peripheral device and incorporates a suitable driver.

[0016] Thereby, both the peripheral device and the application program resulted in inducing the positive feedback to which a price also falls by the volume efficiency accompanying versatility, while versatility increased and a user's convenience improved. It has also helped this that bus specification, such as the hardware itself, and ISA, PCI, and the connection specification of storage equipments, such as IDE and SCSI, have standardized in a personal computer, of course.

[0017] Recently, the connection specification of a peripheral device with easy management of connection, such as USB (Universal serial Bus) and IEEE1394, and wiring is being adopted. From several pairs of those, since these are connection of the twisted pair line, they can be used also as a simple network. It is equipped with the high-speed transfer capability which is equal to the system bus of the past computer, and since picture transmission is possible for IEEE1394, it is leading also as connection specification of household-electric-appliances devices, such as TV and video. Moreover, all control is performed by IEEE1394 specification by the R/W to the register mapped by the address space of the 64-bit format standardized in IEC1212 (ANSI/IEEE Std 1212 Control and Status Register(CSR) Architecture for Microcomputer Buses[ISO/IEC13213]). For this reason, a peripheral device can have an interface independent of the architecture of the host processor controlled by the storage device like SCSI specification currently used. [ many ]

[0018] The prerequisite from which the above-mentioned wide use serves as an advantage on the other hand is that the driver corresponding to various peripheral devices is offered with OS. To this both, the vendor of OS and the vendor of a peripheral device must cleave a big effort. By the operating system of Microsoft, and Windows 95, various drivers are actually contained by as many as 40 floppy disks. Although these all are not drivers, of course, there are not few rates of occupying to the whole. Since the software of driver software depends on OS, software firms must prepare a driver for every OS. A device driver is because it is closely connected with the memory management of OS and is generally operating. It cannot be overemphasized that the part for which the OS itself depends on the architecture of a host processor is large.

[0019] As an attempt which raises the versatility of a device driver, the approach using a general-purpose protocol is in the communication link with a peripheral device, or control as it realizes by SCSI, IEEE1394, and USB. It is the method with which the driver to which OS transmits the packet of SCSI or IEEE1394 is offered, and the device driver of a device proper controls each peripheral device using the driver. It is SCSI even if equipment connection interfaces, such as SCSI and IEEE1394, differ in the same OS, if this method is taken. The driver of the part which controls equipment proper, such as HD and a printer, can be used in common.

[0020] There are some approaches also in such general-purpose contact architecture. In addition to the communication link, the protocol of control command is also prescribed by SCSI. Although the correspondence procedure is prescribed by IEEE1394, the command of control was not specified but it has left the room of a

device with various control protocols.

[0021] Moreover, there is a side face which can be used as a network besides the side face as a general-purpose input/output bus in IEEE1394, and mapping of the Internet Protocol to an IEEE1394 bus top is also proposed (DAVIC IP over IEEE1394.1995 Specifications, 1996). However, the interface which unified the field of a communication network and the field as an input/output bus is not yet realized.

[0022] Now, various peripheral devices are available because OS reads the driver corresponding to each device. However, since the device driver itself was dependent on OS and it did not have versatility, it needed development of the driver of a response respectively for every various OS's. For this reason, there was a problem on which development of the device driver by the peripheral-device vendor will be restricted to specific OS through which it spread well. As this result, it concentrates on specific OS with development of a device driver, and the device which cannot be used by other OS's is increasing. This will bar the diversification doubled with the application of OS, and spoils a user's convenience.

[0023] Another problem is that the resource of OS will be occupied by the driver of the equipment which is not used, and API corresponding to a higher-level protocol, when a peripheral device is diversified.

[0024] Moreover, by IEEE1394, not only a peripheral-device control bus but a network utilization gestalt is considered. It is difficult to grasp all the equipments to which near PC to control is connected beforehand, when used in network, and when two or more PCs are connected to the same IEEE1394 bus as the ability to determine directions according to the equipment connected, it is required that it should be determined which PC has a control. However, the system which has solved this did not exist conventionally.

[0025] Moreover, the system which can control the IEEE1394 equipment which is in remoteness through a telephone network or a wide area network did not exist conventionally, either.

[0026]

[Problem(s) to be Solved by the Invention] Even if it is going to control conventionally the device which interconnected in domestic or the digital networks between homes, and minded the network (1) There is no technique for getting to know the information about the service currently offered on the location of each device which exists on a network, or the network. A user Existence of specific device/service has not been recognized on a network, and actuation or control of an object device was not able to be performed, or offer of service was not able to be received. Moreover, when the part according to a different protocol in interconnect of digital networks was intermingled, the user was not able to perform the actuation or control of an object device beyond a different protocol by there being no technique which tells an actuation command etc. exceeding a different protocol, or offer of service was not able to be received.

[0027] (2) Although it is thought that the so-called information appliance which had the various Internet processing facilities also in domestic will enter in the still nearer future, it worries about the current Internet at the serious lack of the address. It is unreal it to be thought for that the household-electric-appliances device which enters into domestic becomes very many numbers, and to newly consider an IP address to these [ all ]. Then, the two following approaches are proposed.

[0028] - Domestic uses a private IP address.

[0029] - The IPv6 (IP version 6) address is used for domestic.

[0030] However, as for the actual Internet (public network), it is actual to be applied by IPv4 (IP version 4), and when the above approaches are taken, it does not have the approach of accessing from the Internet to a domestic device. Although the user on the Internet (public network) needs to recognize the address of domestic various devices before performing those actuation actually even if it uses these as a solution for this problem, although NAT (network address translation) and an IP masquerade are known, there is no mechanism which realizes this.

[0031] (3) Moreover, conventionally, since the device driver was dependent on OS and did not have versatility, it had a trouble [ need / respectively / for every various OS's / the driver of a response / to be developed ]. Moreover, although building a device driver in abundance beforehand when a peripheral device is diversified was performed well, there was a trouble that the resource of OS will be vainly occupied by the device driver of the equipment which is not used and API corresponding to a higher-level protocol.

[0032] It is not dependent on a specific network and this invention aims at offering the communication device which can realize a unific service provision environment, the service registration approach, and the service provision approach, in order to have been made in consideration of the above-mentioned situation and to solve the 1st trouble of the above.

[0033] Moreover, in order to solve the 2nd trouble of the above, this invention aims at offering the communication device which makes accessible service currently offered in each network even from other networks, even when the networks (for example, IPv4, IPv6 and a private address, IPv4 and a private address, IPv6, etc.) where address systems differ are interconnected.

[0034] Moreover, in order to solve the 3rd trouble of the above, it is not dependent on OS or hardware, and this invention aims at offering the possible communication device of registering a device control program, and the device control program registration approach, when the need arises.

[0035]

[Means for Solving the Problem] (1) This inventions (claim 1) are the communication devices (for example, personal computer etc.) equipped with the means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment, and are characterized by describing dynamically the information about the service which works on self-equipment (the communication device concerned) for said configuration information storage means.

[0036] According to this invention, it communicates through a communication device, and also by accessing this configuration information storage means, a node can recognize timely the application which that communication device has served at that event, the directory service of a network configuration and the service detection of a migration node of it are attained, and its flexibility of employment of a network improves. Especially the effectiveness of changing service configuration information dynamically, since dynamic change of operation of the service will become more intense with [ the case where operation service changes dynamically, and when service is realized by software ] install of software, version up, etc. will become very big.

[0037] The means of communications which operates the register with which the map of this invention (claim 2) was carried out to single-address space, The communication device equipped with a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment (It is [ for example, ] a personal computer etc.) and is characterized by describing collectively the information about the service which works on self-equipment (the communication device concerned), and the information (for example, Vendor ID, a node capability, etc.) about the attribute of self-equipment for said configuration information storage means.

[0038] In case according to this invention it communicates through a communication device, and also both the configuration information which used service as the base, and the configuration information which used equipment as the base can be notified to a node and these other nodes constitute the directory information of the network where the communication device is connected, it is effective in simplifying more selection of whether it considers as the configuration information according to service, or to consider as the configuration information according to equipment. Since both the user who has got used to the actuation and retrieval according to service, and the user who has got used to the actuation and retrieval according to equipment exist and it corresponds to the both, this is especially useful.

[0039] The 1st means of communications which operates the register with which the map of this invention (claim 3) was carried out to single-address space, The communication device equipped with a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment (For example, it is a personal computer etc.) for said configuration information storage means It is characterized by describing a part of configuration information [ at least ] (for example, information on a terminal, information on service) about the network connected to self-equipment (the communication device concerned) through the 2nd different means of communications from said 1st means of communications.

[0040] According to this invention, nodes other than the communication device concerned connected to the 1st means of communications The network configuration information connected to the communication device concerned at the 2nd means of communications It becomes possible to recognize through this configuration information storage means. This result, It becomes possible to recognize the configuration information of the whole network which interconnected through the configuration information storage means through the 1st means of communications, and, therefore, it becomes possible to attain simplification of structure, such as a network control and network service registration, and time and effort.

[0041] This inventions (claim 4) are communication devices (for example, personal computer etc.) which register service into the directory agent who exists in the connected network, and are characterized by having a means to register the service of electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) which communicates with the protocol depending on the data link of said connected network into said directory agent instead of this electronic device.

[0042] According to this invention, a directory agent As opposed to the directory service of the protocols (for example, network layer protocols, such as IP etc.) with which it works It becomes possible to register the services (for example, AV/C protocol of IEEE1394 etc.) offered with data link layer protocols (for example, IEEE1394 layer etc.). Consequently, a directory agent or a directory service becomes that offer layer is fair and possible [ being searched ] about the service developed on the network, and becomes possible [ aiming at simultaneously improvement in a network user's convenience, and improvement in flexibility ].

[0043] This inventions (claim 5) are communication devices (for example, personal computer etc.) which notify the information about service according to the inquiry from the user agent in the connected network, and are characterized by to have a means notify said user agent of the service of electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) which communicates with the protocol depending on the data link of said connected network instead of this electronic device.

[0044] As opposed to service location service of the protocols (for example, network layer protocols, such as IP etc.) with which, as for a user agent, it works according to this invention It becomes possible to acquire the information about the service offered with data link layer protocols (for example, IEEE1394 layer etc.).

Consequently, a user agent or service location service becomes possible [ that offer layer being fair and searching the service developed on the network ], and can aim at simultaneously improvement in a network user's convenience, and improvement in flexibility.

[0045] This invention (claim 6) is set to a communication device according to claim 4 or 5, and is characterized by registering or notifying the logic multiplex identifier of self-equipments (for example, personal computer etc.) as a port for access to said service registered or notified in the case of advice to the registration to a directory agent, or a user agent.

[0046] If it does in this way, said communication device will become possible [ recognizing that it is access to service of said electronic device when there is access to the logic multiplex identifier ], and it becomes possible to perform suitable processing for realizing the service actually.

[0047] On the other hand, a directory agent becomes possible [ offering the unific directory service which becomes possible / answering /, has this logic multiplex identifier as an access point to service of said electronic device, and does not ask the offer layer of service ].

[0048] Moreover, when this logic multiplex identifier is notified as an access point to service of said electronic device, he does not ask a layer, but a user agent will recognize it as what is provided with that service through this logic multiplex identifier, and it is the whole network and he becomes possible [ offering the unific service provision organization which does not ask a layer ].

[0049] In a communication device according to claim 6, this invention (claim 7) is characterized by changing into the command of the protocol which depends for this command on said data link corresponding to it, and transmitting to said electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.), when a command arrives at the port specified by said logic multiplex identifier.

[0050] When doing in this way and said communication device has access to the logic multiplex identifier After carrying out command conversion corresponding to the protocol of the offer data link to the stereo which recognizes that it is access to service of said electronic device, and offers the service actually It becomes possible to perform the command sending out, i.e., to perform a service request, and it has and it becomes possible to aim at implementation of the procedure of the whole "service request -> service implementation."

[0051] Moreover, since the user agent will recognize access to service of said electronic device to be what is performed to the last by the layer which described the command, if even the environment of a service access, the simplification, i.e., this layer, of processing, is prepared, he will mean that access to the various services on this network is attained, and will become possible [ contributing to each of the simplification of the service provision environment of this network, increase in efficiency, and unification-izing ].

[0052] This invention (claim 8) is characterized by having a response table for mapping to the command of the protocol which depends on said data link corresponding to this command for the command which arrived at the port of said logic multiplex identifier in a communication device according to claim 6.

[0053] If it does in this way, said communication device will become possible [ performing command conversion when there is access to the logic multiplex identifier in the procedure for which it was able to opt beforehand ]. By this After carrying out command conversion corresponding to the protocol of the offer data link to the stereo which recognizes that it is access to service of said electronic device, and offers the service actually It becomes possible to perform the command sending out, i.e., to perform a service request, and it has and it becomes possible to aim at implementation of the procedure of the whole "service request -> service implementation."

[0054] Moreover, since the user agent will recognize access to service of said electronic device to be what is performed to the last by the layer which described the command, if even the environment of a service access, the simplification, i.e., this layer, of processing, is prepared, he will mean that access to the various services on this network is attained, and will become possible [ contributing to each of the simplification of the service provision environment of this network, increase in efficiency, and unification-izing ].

[0055] If this invention (claim 9) cannot communicate if the 1st means of communications is followed, but the 2nd means of communications is followed, the electronic device which can communicate, It is the service registration approach in the communication device connected to the network where the electronic device which



can communicate may be connected even if it follows any of the 1st means of communications and the 2nd means of communications. With the electronic device with which registration of the information about the service offered from said each of electronic device through said 1st means of communications was received, and existence has been recognized by said 2nd means of communications and said 1st means of communications about a thing without said advice which leads The information about the service offered by this each of electronic device that should be registered is acquired using said 2nd means of communications. Based on the information about said notified service, and the information about said acquired service, it is characterized by constituting the service directory information on said network.

[0056] It is the service provision approach in the communication device to which at least one electronic device which can communicate was connected when this invention (claim 10) could not communicate when following the 1st protocol, but following the 2nd protocol. The logic multiplex identifier of self-equipment which follows said 1st protocol as a port for access to the service offered by said electronic device is assigned. When a command arrives at the port specified by said logic multiplex identifier, it is characterized by changing this command into the command according to said 2nd protocol, and transmitting to said electronic device.

[0057] (2) The means of communications which operates the register with which the map of this invention (claim 11) was carried out to single-address space, An acquisition means by which the attribute information (for example, unique ID, unit ID, capability, etc.) on the electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) recognized by said means of communications comes to hand, Registration (inclusion to OS) of the device control program (device driver software) which controls said electronic device by publishing the directions which operate the register on said single-address space to said means of communications It is characterized by having the registration means performed working based on the attribute information on said electronic device which came to hand.

[0058] According to this invention, said device control program will play the so-called role of a device driver, but According to this invention, it is based on the attribute information on the electronic device received by the means of communications which operates the register by which the map was carried out to single-address space. Since the device control program which controls said electronic device by publishing the directions which operate the register on said single-address space is registered, the device control program united with the attribute of the object driven if needed during actuation is incorporable into OS.

[0059] moreover, a device control program -- a network loader -- if provided in a bull form (for example, form described in JAVA language), it will become possible to register a device control program, without asking the classification of OS, and the classification of hardware.

[0060] This invention (claim 12) is characterized by said registration means having a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand with said acquisition means, and a means by which the corresponding device control program comes to hand based on said identifier searched for in a communication device according to claim 11.

[0061] If it does in this way, the device control program which suited the attribute of said electronic device can come to hand if needed, and can be used as a device driver.

[0062] In a communication device according to claim 11 or 12, the attribute information on said electronic device is described by the configuration information storage region (for example, Configuration ROM or configuration memory) where it was beforehand set in said electronic device, and this invention (claim 13) is characterized by said attribute information coming to hand by reading the content said acquisition means was described to be by said configuration information storage region.

[0063] Thus, if it is made for the attribute information on said electronic device to come to hand by reading the configuration information storage region in the electronic device concerned, it is expected that the attribute information on the device will usually be described by the configuration information storage region, and it is expected that the suitable information from which the hand of a coming-to-hand [ a suitable device control program ] sake serves as a loan will be acquired.

[0064] This invention (claim 14) is characterized by offering said single-address space in the form of an IEEE1394 bus in a communication device given in claim 11 thru/or any 1 term of 13.

[0065] Since an IEEE1394 bus can be interpreted as a bus which realizes single room, it is possible to adopt the above-mentioned device as it is, dynamic loading through the network of the device driver of the network which was originally difficult becomes possible, and it can raise a user's convenience by leaps and bounds.

[0066] This invention (claim 15) is characterized by setting to a communication device given in claim 12 thru/or any 1 term of 14, and using the identifier which can direct the specific resource of an external network as an identifier of said device control program.

[0067] Thus, it becomes possible for the device control program of said electronic device to come to hand from



an external network a network loader bull, then if needed, and said communication device is opened from the constraint that it must have all the device control programs assumed beforehand, and becomes possible [ enjoying various advantages, such as economization of the capacity of a disk or OS, and version up of software, ].

[0068] A device control program is preferably described in JAVA language etc.

[0069] The communication link between a predetermined electronic device and other communication devices (the 2nd communication device) which can be communicated this invention (claim 16) with a means to operate the register by which the map was carried out to single-address space It is a possible communication device (the 1st communication device) by the means of communications using a logic network. said means of communications -- leading -- said -- others -- a communication device (the 2nd communication device) -- receiving -- said -- an electronic device A means to require acquisition of (attributes [ for example, ], such as personal computer, peripheral-device, AV equipment, and household-electric-appliances device) information (for example, unique ID, unit ID, capability, etc.), A means to perform registration (inclusion to OS) of the device control program (device driver software) which controls said electronic device working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand, It is characterized by having a means to transmit and receive the information about the directions which operate the register on said single-address space through said means of communications between communication devices (the 2nd communication device) besides the above.

[0070] According to this invention, the communication device (the 1st communication device) which is a control subject It can have a function for using said electronic device by considering as agency other communication devices (the 2nd communication device) connected through the logic network. It becomes possible to control a remote electronic device not only through a means to operate the register by which the map was carried out on single-address space but through a logic network, without changing the control program which operates the register on single-address space.

[0071] You may make it the means preferably performed working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand have a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand, and a means by which the corresponding device control program comes to hand based on said identifier searched for.

[0072] Moreover, preferably, the attribute information on said electronic device may be described by the configuration information storage region where it was beforehand set in said electronic device, and said attribute information may come to hand by reading the content described by said configuration information storage region with the communication device (the 2nd communication device) besides the above.

[0073] Moreover, said single-address space may be preferably offered in the form of an IEEE1394 bus.

[0074] Moreover, the identifier which can direct the specific resource of an external network as an identifier of said device control program preferably may be used.

[0075] This invention (claim 17) is the device control program registration approach of registering a device control program working [ a communication device ]. The attribute information on the electronic device recognized by the predetermined means of communications which operates the register by which the map was carried out to single-address space comes to hand. It is characterized by performing registration of the device control program which controls said electronic device working based on the attribute information on said electronic device which came to hand by publishing the directions which operate the register on said single-address space to said means of communications.

[0076] In addition, invention concerning each equipment [ more than ] is materialized also as invention concerning an approach.

[0077] Moreover, the above-mentioned invention is materialized also as a medium which recorded the program for making a computer perform a procedure, a corresponding function, or a corresponding means and in which machine read is possible.

[0078] (3) In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 18) of this invention to the 1st network, and it depends on this 1st network through the 2nd network Said 2nd network is minded for the information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment at least. An offer means to provide, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, By having changed into said 1st command the 2nd command contained in the message received with this receiving means, and having provided the control means which controls said service provision equipment by this 1st command It is not

dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0079] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 19) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, The information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means An offer means to provide through said 2nd network at least, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, By having changed into said 1st command the 2nd command contained in the message received with this receiving means, and having provided the control means which controls said service provision equipment by this 1st command It is not dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0080] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 22) of this invention to the 1st network, and it depends on this 1st network through the 2nd network An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0081] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 23) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0082] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 24) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, A creation means to create the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment based on the information about the service collected with this collection means, An offer means to offer the homepage created with this creation means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0083] In addition, the communication device (claim 25) of this invention The table which registered the 2nd command depending on the communications protocol of said 2nd network for controlling this service provision equipment corresponding to said 1st command which said service provision equipment offers, and which was beforehand defined for every service is provided. By acquiring the information about the 2nd command corresponding to the information about the service collected with said collection means from this table, and creating said homepage, to a homepage It becomes possible to display the list of remote control of service provision equipment realizable using the 2nd command information (remote-control command), and it becomes

possible to create the homepage which had and enumerated the remote-control approaches which can be employed.

[0084] The communication device (claim 26) of this invention moreover, said message The 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment is included. Said control means By changing into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command When the 2nd specific command information (remote-control command) is received through said receiving means If the table corresponding to the above is referred to, it comes to be turned out what kind of actuation it should just perform to the equipment (service provision equipment connected to the 1st network in this case) of a request of the 1st network.

[0085] The communication device (claim 27) of this invention moreover, said message The 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment, The address depending on the communications protocol of said 2nd network and the multiplex identifier for specifying said service provision equipment depending on said 1st network are included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command. The node which received the homepage by controlling the service provision equipment identified in said multiplex identifier by this 1st command By working on the object by which hyperlink reference was carried out as 2nd command information (remote-control command) It becomes possible to operate the service provision equipment which became possible [ specifying the service provision equipment connected to said 1st network which is a controlled system, and specifying actuation of the request ], had and was connected to said 1st desired network by remote control.

[0086] The communication device (claim 28) of this invention moreover, said homepage The program for generating the message containing the 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment is included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the response table of said 1st command and said 2nd command. The node which received the homepage by controlling service provision equipment by this 1st command. The program (JAVA program) matched with it is started. It becomes possible to operate the service provision equipment which it became possible for the command which specifies the service provision equipment connected to said 1st network which is a controlled system, and specifies actuation of the request to be made to publish, and had and was connected to said 1st desired network by remote control.

[0087] The communication device (claim 29) of this invention moreover, said control means By starting the program (for example, CGI script) for publishing said 1st command by the message received with said receiving means The node which received the homepage starts the program (CGI script) matched with it. the command which specifies the service provision equipment connected to said 1st network which is a controlled system, and specifies actuation of the request -- issuance \*\*\*\*\* -- it becomes possible to operate the service provision equipment which what of became possible, and had and was connected to said 1st desired network by remote control.

[0088] Moreover, in case the communication device (claim 30) of this invention transmits information in response to the demand from the partner node which received said homepage by including the information which specifies the communications protocol at the time of transmitting information as said message, the sending-out approach can be specified now, and it can have it, and can send information into a transmitting partner certainly. This has him, especially when the partner who should transmit does not have the receiving capacity of a network layer packet. [ effective ] Moreover, when the node which receives transmit information is not supporting the same network layer protocol as the 2nd command information (remote-control command), or when great cost starts the capsulation to the network layer protocol of transmit information, it becomes possible to urge the equipment which received said homepage to the information transmission of those other than a network layer protocol.

[0089] Furthermore, the header information depending on this communications protocol at the time of transmitting the information other than information that the communications protocol at the time of transmitting information to said message is specified may be included.

[0090] The communication device (claim 35, 5th operation gestalt) of this invention It is the communication device connected to the 1st network and 2nd network. The 2nd logic multiplex identifier is assigned to the service offered by the 1st logic multiplex identifier of the equipment of the arbitration on said 1st network. The 1st [ said ] logic multiplex identifier and the 1st address of the equipment on the 1st [ said ] network which offers the service, A storage means to memorize the response relation between the 2nd accessible address and

said 2nd logic multiplex identifier from said 2nd network, A presentation means to show as service which can access each service of said 1st logic multiplex identifier by said 2nd address and said 2nd logic multiplex identifier from said 2nd network, By performing the packet transfer for offering the service on the 1st [ said ] network shown with said presentation means between said 1st and 2nd networks based on the response relation memorized by said storage means The address system for which the 1st network differs from the 2nd network, For example, when the 2nd network is employed for the address system of IPv4 [ the case where the 1st network is employed for the address system of IPv6, when the 1st network is employed for the system of a private IP address ] Access to the service currently offered in the 1st network is realizable to the user of the 2nd network.

[0091] That is, to the user of the 2nd network, the service currently offered in said 1st network shows to the 2nd network as what this communication device offers using the homepage as said presentation means. When there is access to this service from the user of said 2nd network The response relation (address port number translation table) memorized by said storage means is used. By changing the user of said 2nd network, and the packet between these communication devices into the packet of the service compartment for which it is provided in this communication device and said 1st network It will be recognized as exchanging the transparent packet from the service currently offered in the user of said 2nd network, and said 1st network.

[0092] (Claim 36) By having provided further a collection means to collect the 1st addresses of the equipment which offers said 1st logic multiplex identifier and each service on said 1st network, it becomes possible to perform renewal of automatic as said presentation means (for example, a homepage) based on the collection information about service of said 1st network.

[0093] (Claim 37) The 2nd storage means which memorizes the identifier of the packet which can be transmitted to said 1st network among the packets inputted from said 2nd network, By having provided an output means to output only the packet which has the identifier memorized by said storage means among the packets inputted from said 2nd network to said 1st network User authentication can be performed beforehand and trespass of an inaccurate packet to said 1st network can be protected from external networks, such as a public network.

[0094]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of invention is explained, referring to a drawing.

[0095] (1st operation gestalt) The example of the structure of a system which starts this operation gestalt at drawing 1 is shown.

[0096] In this example, as shown in drawing 1, two domestic networks shall interconnect through a public network 2. A telephone network may be used and it may be [ whose public network 2 is ] like the circuit of wide bands, such as ISDN, or a dedicated line the Internet. However, the network with which it is satisfied of a communication band required for utilization and offer of service preferably is used.

[0097] The 1st domestic network consists of the 1st IEEE1394 bus 1. Moreover, the 1st AV contact 4, a personal computer (the following, PC) 6, and digital [ 7 ] one TV shall be connected to this IEEE1394 bus 1.

[0098] The 2nd domestic network consists of the 2nd IEEE1394 bus 3 and home automation network 12. With this operation gestalt, LON (local operating network) of an echelon company shall be used for this home automation network 12. LON of an echelon company is described in detail by obtaining-, for example from homepage (<http://www.echelon.com>) of echelon company etc. information.

[0099] The 2nd AV contact 5, the DVD player 8, digital VTR 9, PC10, and the printer 11 shall be connected to the IEEE1394 bus 3 of the 2nd domestic network. Moreover, PC10 is connected also to the home automation network 12. The home automation network 12 is connected also to an air-conditioner 13 and a microwave oven 14 besides PC10.

[0100] Among the terminal groups connected to these networks, the 1st AV contact 4, PC6, the 2nd AV contact 5, PC10, and the printer 11 have an IP address (here, it considers as a private IP address), respectively, and are the so-called IP terminal. For the IP address of 192.168.2.254 and PC6, the IP address of 192.168.2.1 and the 2nd AV contact 5 shall be [ the IP address of the 1st AV contact 4 / the IP address of 192.168.1.1 and a printer 11 of the IP address of 192.168.1.254 and PC10 ] 192.168.1.2. Thus, the private IP address or the global IP address shall be used for the IP address of the terminal in this operation gestalt (when a public network 2 is not the Internet but ISDN etc.) (when a public network 2 is the Internet), and setting out (setting out of an IP routing table etc.) of the routing device for routing between each terminals shall be performed appropriately. In addition, although a current global IP address is 32 bits, it is likely to become 128 bits in the near future, and the environment which can assign a global IP address to each terminal is becoming actual.

[0101] On the other hand, digital [ 7 ] one TV, the DVD player 8, and digital VTR 9 are 1394 so-called terminals, and are terminals which interpret only 1394 protocol groups (IEEE1394-1995, IEC1883, IEEE1394AV/C, SBP,

etc.).

[0102] Moreover, an air-conditioner 13 and a microwave oven 14 are the so-called LON terminals, and are a terminal which interprets only the protocol group defined by LON.

[0103] The 1st AV contact 4 and the 2nd AV contact 5 have fundamentally the function which interconnects between two or more networks (they are an IEEE1394 bus and a public network in the case of this operation gestalt), respectively. The internal configuration of these AV contacts 4 and 5 is shown in drawing 2.

[0104] As shown in drawing 2, AV contact of this example has 1394 interfaces 21, the data link switch 22, the public network interface 23, the IP processing facility 24, the FANP processing facility 25, the 1394 / IP service location processing facility 26, the service location redundancy 27, the 1394AV command-processing function 28, and 1394 / IP command conversion function 29. Hardware may realize and software may realize each of these functions, respectively.

[0105] 1394 interfaces 21 are the functions used as an interface with 1394 buses.

[0106] The data link switch 22 is a switch for performing data transfer which straddles between networks. In more detail By reference (for example, reference of a synchronous channel identifier, ATM-VCI, transmission wavelength, etc., etc.) of only a data link layer identifier / information As the data transfer point is known beforehand clearly, it is a switch for transmitting the data which set up with protocols, such as FANP, and transmitted the data inputted from 1394 buses to the public network, and were inputted from the public network to 1394 buses.

[0107] The public network interface 23 is a function used as an interface with a public network. For example, if the data link layer of a public network is ATM, it will have the interface of ATM for the function of ATM signaling etc. logically physically.

[0108] The IP processing facilities 24 are many functions of a series of Internet Protocol (TCP/IP protocol suite), such as TCP/UDP/IP.

[0109] The FANP processing facility 25 is a function to perform the band in the data link layer of the transmission route of data, reservation of a virtual transmission-line identifier, and adjustment. In addition, the detail of a FANP processing facility is explained by reference "network interconnection method" in "REJIDENSHARU environment, the Institute of Electronics, Information and Communication Engineers, the information-network seminar research report IN 97-19, and pp.73 1997 [ -78 or ]" (or Japanese Patent Application No. 8-264496, Japanese Patent Application No. 8-272672, Japanese Patent Application No. 9-52125) etc.

[0110] As for the FANP processing facility 25, it is desirable to prepare, in treating service with the need of guaranteeing a wide band to some extent like image data, and when it does not need a band guarantee, it may be excluded. In addition, it is also possible to use the processing facility which followed the RSVP protocol (Resource ReSerVation Protocol; draft-ietf-rsvp-spec-08.txt of the Internet draft) instead of the FANP processing facility.

[0111] Moreover, you may make it control the activity of FANP processing facility 25 grade according to the service to offer. For example, you may make it determine whether use FANP processing facility 25 grade for every group of an IP address and a port number. Or you may make it determine to use it by the explicit demand from a user.

[0112] The 1394-/IP service location processing facility 26 searches the terminal or service connected to 1394 buses, or receives the registration, and when it is recognized and required what kind of terminal/service should exist on 1394 buses, it has the function which notifies the information outside if needed. The 1394-/IP service location processing facility 26 has the processing facility of a service location protocol (draft-ietf-svrlc-protocol-16.txt of the Internet draft) at least.

[0113] The service location redundancy 27 works a service location protocol in the form of the service location of IP base to a public network side. Moreover, it is not the service or the terminal connected to 1394 buses, i.e., IP base. Also about the protocol terminal only for IEEE1394 / service (in the 1st domestic network, they are the DVD player 8 and digital VTR 9 at digital [ 7 ] one TV and the 2nd domestic network) which can recognize and process only a series of 1394 protocols While this AV contact has the function which advertises these terminals / service by becoming these services or the deputy server of a terminal When the these-advertised service is received from a public network side (generally the IP side), it has the function which notifies them to 1394 and IP command conversion function 29 that it should map in the command of IEEE1394, or service.

[0114] The 1394AV command-processing function 28 is a processing facility of the terminal-control protocols (for example, a 1394 AV/C protocol, SBP, etc.) of IEEE1394.

[0115] the 1394-/IP command conversion function 29 has been sent using IP -- it is -- it is -- the control command (for example, RTSP (Real Time Stream Protocol) etc.; in addition) to send RTSP is explained in detail at Internet draft draft-ietf-mmusic-rtsp-02.ps, for example -- \*\*\*\* -- The terminal-control command (for

example, a 1394 AV/C protocol and the command of SBP) of IEEE1394 with which a 1394 bus top is sent is changed mutually, and it has the function notified to the other party.

[0116] Next, in the 2nd domestic network, the procedure of recognizing the terminal and service which exist on the procedure, i.e., the 2nd domestic network, in which the 2nd AV contact 5 acquires the information about the 2nd domestic network is explained.

[0117] An example of the sequence of the terminal / service collection procedure using a device peculiar to IEEE1394 is shown in drawing 3. The configuration ROM in which the predetermined information about the terminal was written is stored in the terminal connected to 1394 buses, respectively. In drawing 3, the 2nd AV contact 5 reads the configuration ROM of each equipments 8-11 connected with 1394 buses 3 (lead), and gathers information in each equipments 8-11. This information gathering may be performed to all the terminals that lead to 1394 buses 3.

[0118] Below, some examples are shown about the information described to Configuration ROM. Here, it explains taking the case of the configuration ROM of PC10. In addition, that what is necessary is to just be actually recognized as a "register" or "a part of room", although it learns from the specification of IEEE1394 and the phrase "ROM" is used in this example, also when it is not ROM (in the cases of RAM etc.), it shall contain.

[0119] The 1st example of the information described to Configuration ROM at drawing 4 is shown. This example describes the service which that PC10 other than the node information (for example, Vendor ID, node capability, etc.) (31 in drawing 4) which is the fundamental information about that terminal offers as unit information to Configuration ROM. That is, this PC10 has the WWW server and the digital album server function, and these are reflected in the content of the configuration ROM (inside 32 and 33 of drawing 4). Thus, it not only explains what kind of terminal self is, but by describing to Configuration ROM, it becomes possible to make it know what kind of service self is offering to other terminals which lead to 1394 buses. Like especially PC, this function is very useful, when two or more functions are realized by one terminal. As information concretely described by Configuration ROM, they are types of services, the attribute (it is the various parameters used in order to receive the service, for example, they are the maximum data transfer rate, an equipment specification, an active parameter, etc.) of the service, etc.

[0120] By the way, it connects also with the home automation network 12, and PC10 also serves as a server of such home automation. That is, control of the various devices (here, there are an air-conditioner 13 and a microwave oven 14) connected with the home automation network 12 has composition which this PC10 performs. In other words, the terminal which leads to the 2nd 1394 bus 3 means that the various devices connected with home automation 12 network are controllable by accessing this PC10. In order to make the terminal on the 2nd 1394 bus 3 know this, the information (service information) about the home automation network 12 is also stored in the configuration ROM of PC10.

[0121] First, the information which shows that home automation service is offered is stored in Configuration ROM (34 in drawing 4). This may be made to recognize to be one unit on 1394 buses. Next, the information which shows that Aircon Service and microwave oven service are offered as this unit dependence directory is described by Configuration ROM, respectively (inside 35 and 36 of drawing 4). By doing in this way, other terminals which lead to 1394 buses can know now what kind of service is offered how also about the service connected to another network which is not 1394 buses, and recognition of service and the large improvement in the operability are expected.

[0122] Next, the 2nd example of the information described to Configuration ROM at drawing 5 is shown. In the 1st example, the 2nd example has also described the information according to terminal to Configuration ROM besides the description (inside 45-50 of drawing 5) about service to description about the service which the terminal offers having been performed as unit information about the terminal (inside 42-44 of drawing 5). These are stored as unit information, respectively and may be stored as a unit dependence directory, respectively. Moreover, in order to distinguish that they are the information according to terminal, and the information according to service, the field (respectively inside 42 and 45 of drawing 5) which shows those distinction (which unit is it?) may exist.

[0123] Here, the information about the terminal (an air-conditioner 13 and microwave oven 14) connected to PC10 through the home automation network 12 as information according to terminal is stored, respectively (inside 43 and 44 of drawing 5). By referring to these, not only the node connected with 1394 buses but the information about other nodes (at this example, they are an air-conditioner 13 and a microwave oven 14) connected to the node connected with the 1394 buses becomes possible [obtaining on 1394 level], and that of other 1394 nodes is very effective in integrative management and control of a domestic network.

[0124] Moreover, these are reflected in Configuration ROM as well as the 1st example when this PC10 has a WWW server, a digital album server function, etc. (inside 45-50 of drawing 5). The concrete rule of the

description is the same as that of the 1st example fundamentally.

[0125] Next, the 3rd example of the information described to Configuration ROM at drawing 6 is shown. This example is the case where only the information about PC10 self is stored. In this case, since the information as not the description that used service as the base but a node, i.e., the information as equipment about self, will be indicated unlike the 1st example and 2nd example, as unit information, the purport whose self is PC or a PC board (for example, 1394PCI board) is indicated.

[0126] Now, the actuation can be demanded from a user by displaying the terminal / service information on the 2nd domestic network collected with the 2nd AV contact 5 as mentioned above on the console of the 2nd AV contact 5 concerned. As the method of presentation in that case, it is also possible to perform the display according to service, and it is also possible to display the terminal base.

[0127] The example of a screen in the case of performing the display according to service to drawing 7 is shown. An icon (i1-i7) is prepared at a time according to [one] the service developed on the 2nd home network like drawing 7, and a user becomes possible [accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment)] by directing service using by the predetermined user interface.

[0128] Here, the screen display of the icon according to service of drawing 7 does not ask a network classification, but is displayed similarly [it is / the service connected to the 2nd IEEE1394 bus 3, and the service connected to the home automation network 12 / fair, and]. This is because it is generally thought that displaying fair as mentioned above is desirable for a user as for to which physical network the service has led in order to be uninterested. The confusion which will be produced when a user is made conscious of a physical network by this can be prevented.

[0129] In addition, there is no need of displaying the information itself written in Configuration ROM not necessarily in a screen, and you may make it display another corresponding information on it. For example, the information currently written in Configuration ROM is considered [that it is generally a code for experts in many cases, and], and is considered [that it is the thin vocabulary of concordance in many cases, and] by the general user. Though the code which means "digital one VCR" was written to Configuration ROM when the example was given, to Japanese people, this vocabulary has thin concordance. Then, it gets used by the general user and you may make it display it as "deep video" or deep "videocassette recorder" etc. instead of "digital one VCR" in such a case.

[0130] Next, the example of a screen in the case of performing the display according to terminal to drawing 8 is shown. An icon (i11-i15) is prepared at a time according to [one] the terminal developed on the 2nd home network like the case according to service, and a user becomes possible [accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment)] by directing service using by the predetermined user interface. Also in this case, by the screen display, a network classification is not asked but the service connected to the 2nd IEEE1394 bus 3 and the service connected to the home automation network 12 are displayed fair.

[0131] As mentioned above, it was the approach of recognizing a terminal or service by reading of the configuration ROM of 1394 buses.

[0132] Next, registration of service using a service location protocol is explained.

[0133] IETF which is the standardization engine of the Internet is examining registration of the service which used the service location protocol, and a retrieval method. these -- an object [terminal / IP] -- service -- beforehand -- some -- classifying -- (1) -- the positional information of the server which offers the service to a directory agent (it is also called a directory server in this operation gestalt) is registered according to those services. A user can know the location of service now by asking this directory agent.

[0134] (2) Prepare IP multicast address according to service. the user who is demanding a certain service -- the IP multicast address -- receiving -- "the service is where -- the message of the semantics?" is flown. A user can know now the location of the server which offers the service because the server which offers the service responds to this.

[0135] It has come to be able to perform service registration and retrieval by the two approaches of saying.

[0136] With this operation gestalt, the 2nd AV contact 5 serves as a directory agent of the service location protocol of the above (1).

[0137] IP terminal on the 2nd domestic network (at drawing 1, they are PC10 and a printer 11) registers the service currently offered into the 2nd AV contact 5 which is a directory agent. First, IP terminal investigates where [on a network] the directory agent exists, and completes the procedure for registering service information. It explains making into an example the case where PC10 registers service, and referring to drawing 9 about this.

[0138] PC10 sends out a service request message to the 2nd IEEE1394 bus 3. A service request message is a message of the semantics "the server which offers this service should reply", and more specifically than the



case of this example sends out the message of the semantics "the server which offers the directory service should reply."

[0139] Since the target types of services are specified as a service request message, the "predicate" field is prepared, and it is described as a "directory service" to this field, and this message is further sent out by making the destination into the directory (agent DA) Discovery multicast address (IP address).

[0140] In this operation gestalt, in the 2nd domestic network, in order to use only as the 2nd IEEE1394 bus 3 the network at which an IP packet arrives, the service request message sent out from PC10 reaches the 2nd AV contact 5 and printer 11 which are a directory agent.

[0141] The 2nd AV contact 5 which is the directory agent who received the service request message returns a "directory agent (DA) advertisement" to PC10, in order to notify that self is a directory agent. In addition, since self is not a directory agent, a printer 11 disregards a service request message (a link layer does not usually receive).

[0142] Next, PC10 is receiving a directory agent (DA) advertisement, and a directory agent recognizes existing in the 2nd AV contact 5.

[0143] Next, PC10 performs registration to the directory agent of the service which self offers. With this operation gestalt, PC10 can receive the service request from the outside as a deputy server also about service of the air-conditioner 13 and microwave oven 14 which are further connected with the home automation network 12 while self offers WWW service (concretely http server) and digital album service.

[0144] While PC10 registers the positional information, attribute information, etc. in service registration about each of the WWW service which PC10 self offers, and digital album service, instead of an air-conditioner 13 and a microwave oven 14, the positional information, attribute information, etc. are registered also with each service on the home automation network (LON) 12.

[0145] An example of the content of the registration information on WWW service and digital album service is shown in (a) of drawing 10, and (b), respectively. URL containing the port number determined as the IP address of PC10 for every service as positional information of WWW service and digital album service is used.

[0146] Moreover, an example of the content of the registration information on Aircon Service for which PC10 acts to (c) of drawing 10 and (d), respectively, and microwave oven service is shown. In this case, the port number of PC10 is assigned to each deputy service. In the example of drawing 10, 15000 is assigned to Aircon Service on LON and 15001 is assigned to microwave oven service on LON. By this, if, as for an external terminal, Aircon Service and microwave oven service exist on PC10, moreover, these services will be interpreted as their being services on IP level with \*\*\*\*\*.

[0147] When it wants to access the port number 15000 of PC10 when an external terminal wants to access Aircon Service of the home automation network 12, and to access microwave oven service, it accesses the port number 15001 of PC10. When it is interpreted as on the other hand it being a service request for air-conditioners when PC10 is accessed by the port number 15000 and accessed by the port number 15001, it is interpreted as it being a service request for microwave ovens, and the control command of passed IP is translated into the control command of LON, and this is turned and sent out to the actual device on the home automation network 12 (an air-conditioner 13 or microwave oven 14). About this actuation, it mentions later taking the case of access to Aircon Service.

[0148] Thus, by service registration of drawing 9, WWW service, digital album service, Aircon Service on LON, and the microwave oven service on LON will be registered into the 2nd AV contact 5. If service registration is successful, the 2nd AV contact 5 which is a directory agent will turn service acknowledgement (ACK) to PC10, and will be returned.

[0149] In addition, registration of printer service is similarly performed from a printer 11 to the 2nd AV contact 5.

[0150] As mentioned above, it will register with WWW, a digital album, an air-conditioner, a microwave oven, and the 2nd AV contact 5 each the service of a printer of whose is a directory agent in the procedure of registration of a service location protocol.

[0151] Now, it is possible to constitute the service information on the 2nd domestic network together with the information acquired by this registration procedure and the information acquired by reading of the configuration ROM on IEEE1394 which gave point explanation.

[0152] Although the configuration approach can consider various classes With this operation gestalt, as the example about the service registered with (i) service location protocol this -- preferential -- displaying -- (ii) -- the service which does not appear here -- specifically Are the node which is not recognized in a service location protocol, and about the node recognized in reading of the configuration ROM on IEEE1394 It is the approach of constituting service information based on the information on Configuration ROM, combining the information on both (i) and (ii), and introducing to a user and the exterior as one "service directory information



on the 2nd domestic network."

[0153] The WWW service, the digital album service, Aircon Service, the microwave oven service, the printer service and the DVD player service recognized by reading of the configuration ROM on IEEE1394 recognized in the procedure of registration of a service location protocol, and video service are more specifically doubled, and all services are recognized. And an icon (i21-i27) is displayed at a time according to [ one ] the service developed on the 2nd home network on the console of the 2nd AV contact 5, for example like drawing 7 . Moreover, a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface like the above-mentioned.

[0154] By the way, although the user agent who is the user terminal which receives offer of service can ask a directory agent the information about the service on the IEEE1394 bus to which self is connected and can also obtain it instead, he is with self receiving the advice from each equipment, and can also obtain the information about service with the registration procedure of the information about service to the directory agent who mentioned above, and the same procedure.

[0155] Next, the case where the user (that is, user of the terminal connected to 1394 buses 1) of the 1st domestic network operates the terminal in the 2nd domestic network (that is, terminal connected to 1394 buses 3 or the home automation network 12) by remote control, and does desired actuation through a public network 2 is explained.

[0156] As shown in drawing 1 , the 1st domestic network and the 2nd domestic network interconnect with the public network 2. As mentioned above, a telephone network may be used and it may be [ whose public network 2 is ] like the circuit of a wide band, or a dedicated line the Internet. Moreover, a private IP address or a global IP address shall be used for an IP address (when a public network 2 is the Internet). (when a public network 2 is not the Internet but ISDN etc.)

[0157] Here, the 1st AV contact 4 shall be the directory agent of the 1st domestic network, and shall recognize the service in a network with the same procedure as what explained the 2nd AV contact 5 previously. PC6 and digital [ 7 ] one TV are recognized as a terminal and, more specifically, a certain service and digital TV service which are offered with PC6 as service are recognized.

[0158] Now, in order to show the service in the 2nd domestic network to the user of the 1st domestic network as first phase, the 1st AV contact 4 tries to collect the service information on the 2nd domestic network (directory information). The 1st domestic network and the 2nd domestic network shall communicate in Internet Protocol in that case. In addition, the technique of this operation gestalt can be similarly applied, when another protocol, for example, IPX, NetBEUI, etc. are used.

[0159] An example of the procedure of information interchange performed to drawing 12 between the 1st AV contact 4 and the 2nd AV contact 5 for collection of service information is shown.

[0160] First, the 1st AV contact 4 sends out the service request which made "predicate" the directory agent towards the 2nd domestic network in order to search the directory agent in the 2nd domestic network. In order to realize this, how to make for example, the number of hop into plurality, and to send an IP multicast (making it a scope include other domestic networks), the approach of sending to the above-mentioned IP multicast address, after attaching source routing or a routing header to the 2nd domestic network, etc. can be considered.

[0161] Here, as an approach of getting to know the IP address, especially IP subnet address (namely, network address) of a house of the other party, for example to the house of the other party, routing information is exchanged by the routing protocol and how to get to know the address of the other party etc. can be considered.

[0162] Now, the 2nd AV contact 5 which is the directory agent of the 2nd domestic network who received this service request tells a directory agent advertisement to the 1st AV contact 4, in order that self may tell the purport which is a directory agent.

[0163] Next, the 1st AV contact 4 sends a service type request to the 2nd AV contact 5, in order to know what kind of service is offered in the 2nd domestic network.

[0164] The digital VTR (this DVTR1394) whose 2nd AV contact 5 is the air-conditioner (this aircon\_lon) connected to LON other than WWW (the service name written by URL is http), a digital album (this album), and a printer (the said lpr) as a service type reply, the microwave oven (this microwave\_lon) connected to LON, the DVD player (this DVD1394) which is 1394 terminals, and 1394 terminals is notified. For example, as shown in drawing 12 , "Service:http://", "Service:album://", "Service:lpr://", "Service:aircon\_lon://", "Service:microwave\_lon://", "Service:DVTR1394://", and "Service:DVD1394://" are notified.

[0165] About the device connected to LON, the service information (URL information showing the location of service) notified from PC10 is notified to the 1st AV contact 4 as it is. That is, about the service registered

with the service location protocol of IP, it has notified to the 1st AV contact 4 as it is.

[0166] About the service which the 2nd AV contact 5 which is the directory agent of the 2nd domestic network has recognized only as 1394 terminals / service In order to try for the 2nd AV contact 5 self which is a directory agent to offer service as a deputy server of the service It is introducing to the 1st AV contact 4 on IP in the semantics of "DVD on 1394", and "DVTR on 1394" using the new service category "service:DVD1394" and "service:DVTR1394."

[0167] Next, the 1st AV contact 4 which received these information goes into the procedure for collecting the detailed information about each received service.

[0168] An example of the collection approach is shown below. That is, about the service which is [ among those ] interested for the 1st AV contact 4 side about all services received by the above-mentioned service type reply, in order to acquire the location and attribute information, a service request and an attribute request are sent to the 2nd AV contact 5 which is a directory agent, respectively. To a service request, it is answered to a service reply (URL : URL; (for example, Service:DVD1394:// 192.168.1.254:20000) which is specifically the location information on the service), and is answered to an attribute reply (attribute information [ on the service ];, for example, attribute information on DVD on 1394) to an attribute request. In addition, for details, it is described by the documents (for example, draft-ietf-svrlc-protocol-16.txt of the Internet draft etc.) of a service location protocol.

[0169] Although the above-mentioned procedure about DVD1394 service is described to drawing 12 , if information is similarly collected about all services the outside of it, the 1st AV contact 4 can collect the service information on the 2nd domestic network like drawing 13 .

[0170] Here, about each service of DVD1394 and DVTR1394, as stated also in advance, the 2nd AV contact 5 can receive the service request from the outside now as a deputy server of these services. That is, instead of 1394 nodes, the 2nd AV contact 5 receives the remote command protocol which is the embodiment of concrete service and which is a protocol of IP, and this is changed into 1394 nodes and 1394 protocols, and is made into them (in addition, it mentions later about the detail). Since it can introduce through the service introduction protocol of IP which is the protocol which does not ask a network about the service (here, they are DVD service and DVTR service) whose exchange is originally possible by doing in this way with 1394 protocol, a network is not asked but it becomes sending of the command to the 1394 above-mentioned node, and controllable from IP node of arbitration (it becomes good control).

[0171] The AV contact 5 of [ 2nd ] the information collected by various replys assigns the port number used as the service window, i.e., the port number for each deputy service, about \*\*\*\*\* service (DVD service and DVTR service) in a deputy. Allocation may be beforehand made by the standardization engine etc. and this port number may be decided by the negotiation of nodes. In the case of this operation gestalt, it is made [ service / on 1394 / DVD ] into 20001 about the DVTR service on 20000 and 1394. By this, moreover, it interprets an external terminal (for example, terminal on the 1st domestic network) as it being service on IP level while it interprets the above-mentioned service as existing on the 2nd domestic network.

[0172] Now, like drawing 14 , on the console, the terminal 4 on the 1st domestic network, for example, 1st AV contact, is a form of the list display of the service which self recognizes, and, in addition to the information about the 1st domestic network, it is displayed based on the information acquired on said service location also about the information on service on the 2nd domestic network (for example, domestic network of OO Mr. \*\*). The method of this display may be based on the same policy as the thing of drawing 11 .

[0173] Next, when an external terminal wants to access various services 2nd domestic [ LAN ], the address and the port number which are introduced by URL of drawing 13 are accessed, respectively.

[0174] For example, a user operates the 1st AV contact 4, brings an image through a public network 2 from the DVD player 8 which are 1394 terminals on domestic [ 2nd / LAN ], and the case where this is projected on digital [ 107 ] one TV is considered.

[0175] Actual actuation of a user is as follows, for example. A user clicks on the icon of the DVD player of drawing 14 first. Then, the manual operation button group for DVD player actuation like drawing 15 is displayed on a screen, for example. Next, a user clicks a desired manual operation button and operates the DVD player 8 by remote control. Moreover, a click etc. specifies that an accepting station is digital [ TV ] by a certain input approach.

[0176] An example of the sequence about the command group which flows a actual network top to drawing 16 at this time, and a protocol group is shown.

[0177] First, the 1st AV contact 4 slashes an image into digital [ 7 ] one TV, and it operates the following sequences so that it may perform setting out for displaying this. That is, according to IEC1883 protocol, the synchronous channel on the 1st IEEE1394 bus is secured. At this time, the synchronous channel number of the acquired synchronous channel presupposes that it is #y.

[0178] Next, the 1st AV contact 4 sends a command using the control command (for example, 1394 AV/C protocol) with which it was beforehand set in standardization bodies, such as 1394TAs, in order to turn ON a power source digital [ TV / 7 ] and to project the image from synchronous channel #y on a screen. If a command is received, you may make it return ACK to the 1st AV control unit 4. It means that the circuit from the 1st AV contact 4 to digital [ 7 ] one TV was secured by this.

[0179] Getting [ or ] mixed up with this, the 1st AV contact 4 publishes the command to the DVD player 8 to the 2nd AV control unit 5-like in parallel. Here, the DVD player 8 is interpreting the 1st AV contact 4 as it being IP service. A command is published to the port of the deputy server of the 2nd AV contact 5 (IP address = 192.168.1.254), 20000 [ i.e., ].

[0180] Here, as a command for remote operation, RTSP (RealTime Streaming Protocol) is used, for example. RTSP is a protocol for controlling a remote real-time signal, and it has a discussion in IETF which is the standardization engine of the Internet. For details, it is indicated by Internet draft draft-ietf-mmmusic-rtsp-02.ps.

[0181] The 1st AV contact 4 publishes a command (for example, the SETUP command and the PLAY command) required in order to reproduce the DVD player 8 on RTSP.

[0182] The 2nd AV contact 5 which received the SETUP command of RTSP interprets it as the control to the DVD player 8 being started from now on, and performs reservation of the band for image transmission on the 2nd IEEE1394 bus 3 to which the DVD player 8 is connected, i.e., a synchronous channel. This is performed by IEC1883. Here, the secured synchronous channel number is set to #y. A band may be good also as using experiential values (for example, if it being MPEG 6Mbps(es) etc.), and may include desired value into a message.

[0183] Moreover, the 2nd AV contact 5 which received the PLAY command of RTSP publishes a command to the DVD player 8 with the corresponding command (for example, a command called DVD-PLAY shall specify) to which this was specified as protocols between 1394 terminals, such as 1394 commands, i.e., a 1394 AV/C protocol etc.

[0184] Conversion of such a command is performed by the 1394-/IP command conversion function 29. The flow of the processing is explained referring to drawing 17. The command on IP is received by the service location redundancy 27. Command conversion of the received command is carried out by the 1394-/IP command conversion function 29. As it was called the table 61 corresponding to a command for DVD, and the table 62 corresponding to a command for DVTR, it prepares according to service of the table which described the relation between the command on IP (or actuation), and the command on 1394 (or actuation), the command sent by IP based on the table according to these services is changed into the command of 1394, and, specifically, delivery sending out is directed for this to the 1394AV command-processing function 28. And it is directed in sending out of a actual command by the carrier beam 1394AV command-processing function 28.

[0185] In addition, with the above, when a command flows towards reverse, namely, also when 1394 commands are inputted and it changes and outputs this to the IP command, a procedure becomes the same. That is, 1394 commands are received by the 1394AV command-processing function 28, this is changed into the IP command based on the table according to service in the 1394-/IP command conversion function 29, and this is sent out by the service location redundancy 27.

[0186] Now, if it does in this way and a command reaches the DVD player 8, transmission of actual image data will be performed through synchronous channel #x of the 2nd 1394 bus 3. After an ACK signal returns (an ACK signal may be changed in addition into O.K. of RTSP on public networks (ISDN or Internet)), as for this, actual data transfer is started.

[0187] The 2nd AV contact 5 sends out image data to a public network 2 through the data link switch 22. This may be sent in an MPEG multiplex form in that case.

[0188] The sent-out image data are sent to the 1st AV contact 4 through a public network 2. The 1st AV contact 4 sends the received image data to synchronous channel #y of the 1st 1394 bus 1 through the data link switch 22, and image data are eventually reproduced in digital [ 7 ] one TV. Consequently, the 1st user domestic [ LAN ] can see now the image from the DVD player 8 on domestic [ 2nd / LAN ] in digital [ 7 ] one TV.

[0189] In addition, as mentioned above, it is desirable that the FANP processing facility 25 or other RSVP processing facilities realize the band in the data link layer of the transmission route of image data, reservation of a virtual transmission-line identifier, and adjustment. By using FANP etc., it becomes securable [ the communication resource which does not ask network classification ]. An example of the sequence at the time of making it such is shown in drawing 18. In drawing 18, reservation of the communication resource of the data link which serves as a path of image data by FANP, adjustment of an identifier, setting out of a contact, etc. are performed in advance of sending of actual image data.

[0190] Next, it considers that the 1st user domestic [ LAN ] operates the 1st AV contact 4, and operates the air-conditioner 13 (it is a LON terminal) on domestic [ 2nd / LAN ] as other examples of remote operation through a public network 2.

[0191] Actual actuation of a user is as follows, for example. A user clicks on the icon of the air-conditioner of drawing 14 first. Then, the manual operation button group for air-conditioner actuation is displayed on a screen, for example. Next, a user clicks a desired manual operation button and operates an air-conditioner 13 by remote control.

[0192] An example of a sequence is shown about the command group and protocol group which flow a actual network top to drawing 19 at this time.

[0193] First, the 1st AV contact 4 publishes the command to an air-conditioner 13 to PC10 of a deputy server shown on a service location. Here, the 1st AV contact 4 is interpreted as it being IP service whose PC10 offers the air-conditioner 13. A command is published to the port of PC10 which is a deputy server, 15000 [ i.e., ].

[0194] Here, CCCP (Cam CoderControl Protocol) can be used as a command for remote operation. Although CCCP is a protocol for performing control of a remote camcorder through the Internet, control of various electrical machinery and apparatus shall be possible at the same view, and the command group for air-conditioners shall exist in CCCP especially. In addition, the detail of CCCP is indicated by Internet draft draft-ohta-ccc-video-00.txt.

[0195] The 1st AV contact 4 publishes a command (POEWR\_ON command) required to turn ON the power source of an air-conditioner 13 on CCCP.

[0196] PC10 which received the POWER\_ON command of CCCP publishes a command for an air-conditioner 13 with the corresponding command (for example, a command called LON\_POWER\_ON shall specify) to which this was specified as a protocol between the LON command and a LON node.

[0197] Conversion of such a command is performed within PC10. The flow of the processing is explained referring to drawing 20. The service deputy reception function 71 receives the command on IP. Command conversion of the received command is carried out by the CCCP/LON command conversion function 72. The table corresponding to a command for LON, i.e., the table which described the relation between the command on IP (or actuation) and the command on LON (or actuation), is specifically prepared in the CCCP/LON command conversion function 72, it changes into the command which should be sent to an air-conditioner 13 through LON from the command sent by CCCP based on this table, and delivery sending out is directed for this to the LON command issuance function 73. And it is directed in sending out of a actual command by the carrier beam on-command issuance function 73.

[0198] With the above, when a command flows towards reverse, namely, also when the LON command is inputted and it changes and outputs this to the CCCP command, a procedure becomes the same.

[0199] In addition, when an ACK signal returns (the ACK signal is shown in addition as O.K. in; drawing 19 which may be changed into O.K. of CCCP on public networks (ISDN or Internet)) This is also notified to the 1st AV contact 4.

[0200] In addition, it cannot be overemphasized that the mechanism explained with this operation gestalt can be applied not only to a domestic network but to a general enterprise network and the network technique for realizing especially the so-called "mobile environment."

[0201] Moreover, although this operation gestalt explained as a protocol of a network layer, using IEEE1394 and LON as a protocol of IP and a data link layer, it is also possible as a protocol of a network layer to use techniques, such as Ethernet and ATM, as DSM-CC which is advancing the standardization by DAVIC, and a protocol of data link layers, such as IPX.

[0202] By the way, although the function of service location service and the function of command conversion were prepared in AV contact and AV contact offered service with the above-mentioned operation gestalt, the node which is performing AV contact of this operation gestalt, i.e., network interconnect, does not need to perform these functions, for example, it prepares in PC6 or PC10 in drawing 1, and service may be made for them to provide.

[0203] in this case, like the case where AV contact of drawing 2 has realized service Network I/F (equivalent to 1394 I/F21 of drawing 2 R> 2), the IP processing facility 24, the 1394 / IP service location processing facility 26, the service location redundancy 27, the 1394AV command-processing function 28, and 1394 / IP command conversion function 29 The control to which mount in the node of PC6, PC10, or others, and a network communication resource is made to secure further, What is necessary is just to mount the FANP processing facility 25 or the control processing facility by RSVP, when network control, such as control which adjusts the identifier used between networks, is required.

[0204] Moreover, it is also possible to mount the function of service location service and the function of command conversion for differing mutually.

[0205] In addition, although a private IP address is used for the IP address of a terminal when a public network 2 is not the Internet but ISDN etc., or a global IP address shall be used for the IP address of a terminal in the above explanation when a public network 2 is the Internet. For example, address translation, such as NAT (Network Address Translation), is used. When a public network 2 is the Internet, a global IP address is used for the node ( drawing 1 AV contact terminal) which interconnects a network at least, and you may enable it to use a private IP address for other nodes. In this case, from an external network The global IP address of the node which interconnects a network, A group with the port number for pointing to the private IP address (or group of a private IP address and a port number) of the node used as the destination is made into the destination. Transmit an IP packet and a table is referred to in the node which interconnects a network. You may make it change the group of the global IP address and a port number concerned into the private IP address (or group of a private IP address and a port number) of the node used as the destination.

[0206] (2nd operation gestalt) This operation gestalt explains the case where 1394 equipments by which PC with an IEEE1394 interface was connected to the 1394 same buses are recognized and used.

[0207] Generally, various equipments may be connected to 1394 buses and PC does not have the driver software for controlling the information and it about all the equipments connected beforehand.

[0208] So, with this operation gestalt, information on the equipment connected to 1394 buses is collected. The outline of the procedure is as follows.

[0209] i) 1394unit is recognized first. Specifically, it is unique of 1394 nodes. ID and a unit number are acquired.

[0210] ii) Next, category distinction of each unit is performed. And it judges whether it is a category corresponding to a registered logical device.

[0211] An occupancy condition is acquired about iii, next a registered device (a standard driver is used still in this case).

[0212] iv) And the occupancy condition of 1394unit(s) which are not registered is judged.

[0213] Moreover, with this operation gestalt, the following are treated as an event which occurs in asynchronous and changes the configuration of a device driver.

[0214] i) Bus reset of the utilization demand iiIEEE1394 interface of the equipment by application (addition of 1394 equipment, deletion)

iii This operation gestalt is explained in detail below modification of the occupancy condition of equipment.

[0215] First, a hardware configuration is explained.

[0216] The example of a configuration of PC applied to this operation gestalt at drawing 21 is shown. the main memory by which, as for 82, the processor was connected [ 81 ] to the local bus of a processor for PC, as for 83 -- 84 -- a system bus -- 86 and 87 express an IEEE1394 interface and, as for 88, 85 expresses a hard disk for secondary storage, respectively.

[0217] Secondary storage 85, the IEEE1394 interface 86, and the IEEE1394 interface 87 are connected to the system bus 84, respectively. Secondary storage 85 is constituted by the flash EEPROM.

[0218] The hard disk 88 is connected by the IEEE1394 interface 87 in the interior of the case of PC81.

[0219] The IEEE1394 interface 86 is connected to the printer 90 placed out of the case of PC81, FAX91, massage equipment (it is only called massage equipment below; used as reclining seat mold massage equipment) 92, and a toaster 93, respectively. In addition, on explanation, FAX91 shall have a unit corresponding to a FAX function and scanner ability, and a unit corresponding to printer ability, and massage equipment 92 shall have a unit corresponding to the massage device to upper-half-of-the-body parts, such as the back and a neck, and a unit corresponding to the massage device to lower-half-of-the-body parts, such as a guide peg.

[0220] Next, the software structure of an operating system (the following, OS) is explained.

[0221] An example of the software structure in PC81 of this operation gestalt is shown in drawing 22 .

[0222] In the interior of OS of drawing 22 , in 101, the logical device function manager of OS and 102 express a secondary-storage function manager, and 103 expresses 1394 interface management functions, respectively.

[0223] OS manages secondary storage 102 and a hard disk 103 directly. On the other hand, about each hardware of a printer 90, FAX91, massage equipment 92, and a toaster 93, recognition and registration of a device are performed through 1394 function managers (about this procedure, it mentions later).

[0224] 111,112 is a device driver which the subordinate of the secondary-storage function manager 102 has, and controls secondary storage 85 and a hard disk 88, respectively. 113,114 is a device driver which the subordinate of 1394 interface management functions 103 has, and controls the IEEE1394 interfaces 86 and 87, respectively, respectively.

[0225] OS of drawing 22 API (Application Programing Interface) and JAVA 121 expresses a 1394 management object between APIs.

[0226] JAVA of drawing 22 SPI (System Programing Interface) and JAVA In between APIs 122 expresses a logical device management object. 131,132,133,134, respectively A modem, A printer, a scanner, and the logic

device-class object that corresponds unknown are expressed. 131-1-2,132-1,133-1,134-1-3 express the logical device object managed by the logic device-class object of 131,132,133,134, respectively (about the detail of an unknown class, it mentions later).

[0227] OS of drawing 22 API and JAVA In between SPIs 151 to unit1 (104 in drawing 2222 ) of a printer 90 To unit1 (105 in drawing 22 ) of FAX91, 153 152 to unit2 (106 in drawing 22 ) of FAX91 154 expresses the physical device object corresponding to unit1 (109 in drawing 22 ) of a toaster 93 in 156 corresponding to unit2 (108 in drawing 22 ) of massage equipment 92 in 155 to unit1 (107 in drawing 22 ) of massage equipment 92, respectively. Moreover, 161, 162, and 163,164,165,166 express the driver object corresponding to the physical device object of 151-156, respectively.

[0228] An arrow head expresses the reference relation of each object in drawing 22 . By having reference relation, the method of the object of a reference place can be started and a state variable can be read. For example, the physical device objects 151-156 mean being registered as a physical device object which the subordinate of a 1394 management object has by having the reference relation which starts in the 1394 management object 121. 151 is registered into the logical device object 131-2 of a printer class, the driver object 161 is registered into the physical device object 151, and other things are the same.

[0229] Next, initialization of OS is explained.

[0230] After powering on, PC81 reads the program stored in secondary storage 85, and starts OS. Although not asked especially about the general specification of OS, the compiled Java code shall be performed on OS. In addition, it is Java although there is various reference about Java. Language Specification It is explained in detail at <http://java.sun.com>.

[0231] With this operation gestalt, the hard disk 88 connected to the IEEE1394 interface 87 is beforehand decided as 1394 equipments directly managed by OS. the register with which it operates "resemble carrying out reading appearance", and, as for the IEEE1394 device, the hard disk 87 was defined [ the writing of the value to a register, or ] beforehand, as for PC81 -- unique of the IEEE1394 interface of PC81 self By writing in ID shows that PC81 with the IEEE1394 interface 87 uses a hard disk 88 exclusively.

[0232] OS of PC81 has API (Application Programing Interface) which can perform issuance and a response of the transaction request of an IEEE1394 interface from a Java program. The Java code which manages the IEEE1394 device connected to each 1394 interfaces through Above API is performed after starting of OS by initialization of PC81. This is called a 1394 management object. Moreover, OS shall be equipped with the dynamic object loading device which obtains the identifier of the code which corresponds from the identifier of an object class, and generates an object.

[0233] Below, the object by which xx class object and a certain class were substantiated in the object in connection with the xx code and a certain whole class for storing of the Java code and a transmission gestalt is called xx object. For example, Java of the equipment corresponding to a logic device-class object and each physical unit for the object which manages a certain type of all logical units The object which offers API is called a logical device object. Moreover, a certain identifier shall be given to the code of an object and it shall be discriminated from other objects. The identifier may be embedded at object code and may be expressed by the address of ISO1212 format that the file name or it which stores it is stored. On the other hand, the identifier discriminable from other objects shall be given to a meaning by the PC concerned at least at the object. For example, it is the address of the virtual-memory space where an object is stored. In case it is used by IEEE1394 bus, as for an identifier, to be identified by the meaning on an IEEE1394 bus is desirable.

[0234] Next, recognition of a physical unit is explained.

[0235] Completion of initialization of 1394 interfaces by OS generates the 1394 management object 121 and the logical device management object 122. The 1394 management object 121 and the logical device management object 122 hold mutual reference, and they perform recognition and registration of a device, exchanging information mutually.

[0236] The 1394 management object 121 collects the information on the equipment connected to the IEEE1394 interfaces 86 and 87, and recognizes 1394 nodes each. However, the hard disk 87 with which OS was beforehand defined as what is used exclusively at the time of initialization of the 1394 management object 121 is excepted from recognition. The 1394 management object 121 is node in the TOPOLOGY\_MAP register or SPEED\_MAP register which 1394 interfaces each of PC81 have through the above-mentioned 1394 control API. The read-out demand of a configROM field is published to each node for every ID, and it is unique of the node concerned. It will be each unit if ID and unit recognize two or more existence. ID and capability are obtained. The format of these registers is IEC. It is set by 1212 (ANSI/IEEE Std 1212 Control and Status Register(CSR) Architecture for Microcomputer Buses[ISO/IEC13213]), and, for details, omits here.

[0237] The 1394 management object 121 is unique eventually. The list of groups of ID, unitID, and capability is obtained, and these devices are registered. The 1394 management object 121 reads the value of the above-

mentioned register from a printer 90, FAX91, massage equipment 92, and a toaster 93, and generates the 1394 physical-unit objects 151-156 corresponding to each unit. FAX92 and massage equipment 93 have two unit(s), and generate the physical device object 152,153,154,155 which corresponds, respectively. If generation of an object is completed, the 1394 management object 121 will notify completion of physical device registration to the logical device management object 122.

[0238] The equipment removed from the object of recognition is good also as not considering as the object of recognition, when the value which the own register of equipment other than the equipment beforehand occupied by OS expresses occupancy, and shows occupancy there is written in.

[0239] Here, before explaining registration, the structure of a program (here, it is called an object) and actuation which control a device are explained.

[0240] It corresponds to the function of each equipment and 131-1,132-1 and the logical device object of -- provide application with I/O API. Each logical device object is managed by logic device-class objects prepared for every classification, such as a file and a printer. Although each logical device object belongs to only one logic device-class object, one logic device-class object may have two or more logical device objects in a subordinate. For example, although the logical device object 131-1 of a printer belongs to only one logic device-class object 131, the subordinate of the logic device-class object 131 of a printer has two logical device objects of 131-1,131-2.

[0241] A physical device object exists in 1394 units and 1 to 1 response. One physical device object may be referred to from two or more logical device objects. For example, the physical device object 152 is referred to from two logical device objects, the logical device object 131-1 of a printer, and the logical device object 133-1 of FAX, while it supports unit1 of a printer 91.

[0242] With this operation gestalt, PC81 shall have a printer, a scanner, FAX, and the logic device-class objects 131-134 corresponding to each unknown device class. Each logic device-class object is [ -- It has n. ] the logical device object 131-1 to the subordinate. -- It is n and 132-1. -- It is n and 133-1. -- It is n and 134-1. The physical unit with which the Java application performed with PC81 belongs to the difference in mounting of a physical unit through these logical device object at the class of \*\*\*\*\* identitas can be used by the same approach. This is Java for every logic device-class object. It is because SPI is communalized.

[0243] For example, the address and the procedure of an IEEE1394 register at the time of accessing printer equipment are ANSI. X3T10 Serial Bus It is set as Protocol (SBP). A printer is controllable, if a device driver generates the message of an IEEE1394 format in accordance with Above SBP no matter an IEEE1394 interface may be mounting [ what ]. Furthermore, if the device driver is described by Java independent of hardware or OS, as long as the system program interface to the driver of an IEEE1394 interface is the same, in any OS's, the same printer device driver is usable.

[0244] Application can obtain the list of the logic device-class objects 131-134 by requiring a device-class list of the logical device management object 122. The list of the logical device objects belonging to the same types, such as each printer and a scanner, can be obtained from a logic device-class object. The logical device management object 122 also performs management of registration/deletion of a logic device-class object.

[0245] Next, initialization of the logic device-class object by the logical device management object 122 is explained. An example of a logical device management object initialization procedure is shown in drawing 23.

[0246] The logical device management object 122 generates the logic device-class object 131,132,133 corresponding to the device class defined beforehand, a printer, a scanner, and FAX, and makes reference between these objects shown by the arrow head in drawing 2 (steps S11-S14).

[0247] Each logic device-class object of these 131,132,133 initializes following generation (; step S15 to which the logical device management object 122 waits for the completion of initialization in the meantime). Completion of initialization notifies that initialization was completed to the logical device management object 122.

[0248] The unknown logic device-class object 134 which manages the physical device with which the carrier beam logical device management object 122 finally has not been recognized by each logic device-class object of 131-133 in advice of completion is generated and initialized (steps S16 and S17). The logical device management object 122 will be in the completion condition of initialization, if the advice of completion of initialization of an unknown class is received (step S18).

[0249] Next, it explains, taking the logic device-class object 131 for an example about initialization of a logic device-class object. An example of a logic device-class object initialization procedure is shown in drawing 24.

[0250] The logical device management object 122 passes the reference to the 1394 management object 121 to the generate time of a logic device-class object. The logic device-class object 131 requires the reference to a physical device object of the 1394 management object 121 (step S21).

[0251] The 1394 management object 121 will return reference in an order from the physical device object 151 according to the reference which the self-object holds, if reference of a physical device object is required.



[0252] When the reference to the physical device object 151 comes to hand, the logic device-class object 131 starts the attribute value acquisition method of an object 151, and is unique. ID, unit ID and capability are acquired (step S22). These values have beforehand the table which judges whether it agrees in self-device class, and the logic device-class object 131 can judge whether the acquired physical device object 151 agrees in a self-class.

[0253] unique of a physical device 151 ID, unit Since ID was a value which shows a printer, the logic device-class object 131 generates the logical device object 131-1 corresponding to the physical device object 151, and makes initialization start. Also at this time, as for a logic device-class object and a logical device object, it has reference relation mutually, and the logical device object 131-1 is registered as a subordinate of the logic device-class object 131 (steps S23-S24).

[0254] This judgment is unique. ID, unit The combination of not only ID but other attribute value may perform. Moreover, it is unique, without a logic device-class object having a table. ID and unit You may ask the retrieval server which is out of PC81 by using ID as a key.

[0255] Hereafter, succeedingly, the logic device-class object 131 requires the reference to a physical device of the 1394 management object 121, and does the same activity even to the last physical device 156 about 152, 153, and --. Since unit2 of FAX152 has capability of a printer, this is also registered into a printer class object as a logical device object 131-2 (steps S21-S24).

[0256] After an activity is completed about all physical device objects, it waits for the advice of the completion of initialization from the registered logical device object 131-1,132-2 (step S25). If the advice of the completion of initialization from the logical device object 131-1,132-2 is received, the logic device-class object 131 of a printer class will notify completion of initialization to the logical device management object 122 (step S26).

[0257] Next, it explains, taking the logical device object 131-1 for an example about initialization of a logical device object. An example of a logical device object initialization procedure is shown in drawing 25.

[0258] After the logical device object 131-1 initializes own attribute value, it publishes an initialization demand to a physical device 151, and waits for the advice of completion from 151 (steps S31 and S32). Reception of advice of completion publishes advice of completion to the logic device-class object 131 of a printer class (step S33). The physical device object 151 which received the initialization demand determines the device control code corresponding to a physical unit 90, reads it, generates the device control object 161, and registers it into a physical device object.

[0259] Next, it explains, taking the physical device object 151 for an example about initialization of a physical device object. An example of a physical device object initialization procedure is shown in drawing 26.

[0260] In addition, generation of a physical device object is performed by the 1394 management object 121 before generation of a logical device object, and when, as for initialization here, the 1394 management object 121 generates the physical device object 151 unlike generation, the code of a printer control proper is not read.

[0261] The device control code to load is determined as follows, for example. The 1394 management object 121 is attribute value unique. ID, unit It is the attribute value unique to which it has the table which searches for the class name of a device control code from ID, capability, and a logic device-class object, and self has the physical device object 151 in the 1394 management object 121. The inquiry demand containing ID, unitID, and capability is published, and a class name is acquired as the return value (step S41). The identifier of a device control code is good at the pathname which shows the file of the PC concerned as mentioned above. Of course, the inquiry based on attribute value may be published and acquired to the exterior of PC81.

[0262] A device control code is loaded by the dynamic object loading function from the class name acquired by the above-mentioned approach, the device control object 161 is generated, and it registers with the physical device object 151. The physical device object 151 publishes the initialization demand of hardware, after initializing attribute value of the device control object 161 (steps S42-S44).

[0263] It will be read if the code corresponding to a class name exists locally. If the class name shows the resource on the network of RIMOTO, it will acquire from on a network. When it does not exist locally [ even when the class name has not pointed out the resource on a network clearly / a code ], the location on a network is acquired using the retrieval server on a network etc., and a code is read.

[0264] Next, the device control object 161 prepares the packet which performs the register writing for initialization of hardware, and initializes a call and a physical unit 90 for the system call of 1394 transactions. If initialization is completed, the physical device object 151 will publish advice of completion to the logical device object 131-1 (step S45).

[0265] By the way, the thing registered into two or more logical device objects (131-1,133-1) like [ a physical device object ] the physical device object 152. Such a physical device object will receive two initialization demands or more. In the 2nd initialization, if it compares whether it is the same as that of the device control



object which the device control object determined from attribute value gained at a time (step S44), and same and it is [ the same thing is used and ] different, a device control object will newly be read and generated. Although the same device control object 162 is used for a printer class and a FAX class in the physical device object 152, for this, a device control object is Java of both a printer and FAX. It is because it is what supports SPI. The device control object loaded first is Java of a printer class. If only SPI is supported and the FAX class is not supported, the device control object which newly supports both searches and comes to hand, or the support of a FAX class is stopped. If coexistence is impossible, suppose that priority is given to the class loaded first.

[0266] Now, when logical device classification generally increases, it is inefficient-like in respect of utilization of resources, such as memory, to prepare beforehand all the logic device-class objects that may be used.

Moreover, when one physical unit may be used from many logic device-class objects and a low order device control program (device control object of this operation gestalt) is changed depending on a high order logic device-class object, the procedure of determining a high order logical device according to a physical device becomes complicated. Especially, it is IEEE. By bus which is introduced into a home like 1394 buses and used also as a domestic network, it is difficult to limit the device connected beforehand.

[0267] It is appropriate in the above-mentioned network for a user to determine the high order logical device rather specified according to a user's utilization gestalt, and to use the connected equipment by the approach. For this reason, with this operation gestalt, by preparing an unknown device class, the usage has recognized strange equipment for the time being, and the approach of newly adding the high order logical device set by equipment so that it might mention later in detail is taken.

[0268] The 1394 management object 121 has two or more logical devices and the table of the class name corresponding to attribute value, and in case a physical device object performs 2nd initialization, the identifier and attribute value of two logic device-class objects may be specified, and you may ask the 1394 management object 121.

[0269] Next, initialization of the unknown logic device-class object 134 is explained.

[0270] The unknown logic device-class object 134 receives the reference to the 1394 management object 121 to a generate time like the logic device-class object 134 to 131-133. And the reference to each physical device object of 151, --, 156 is obtained like initialization of the logic device-class objects 131-133.

[0271] The unknown logic device-class object 134 obtains the reference to the physical device object 151 first. The unknown logic device-class object 134 asks the physical device object 151 whether have the reference to a logical device object, if it has, will stop recognition of the physical device object 151, and will receive the reference to the following physical device object 152. Since each is registered into other logical device objects, the physical device object 151,152,153 does not perform registration as an unknown device.

[0272] On the other hand, the physical device object 154 does not have the reference from a logical device object. The unknown logic device-class object 134 generates the logical device object 134-1 corresponding to the physical device object 154, and registers it into self here. The logical device object 134-1 registers the physical device object 154 into self. The unknown logical device object 134-1 does not require initialization of the physical device object 154. Therefore, a device control object is not registered into the physical device object 154 at this event.

[0273] Initialization with the same said of the physical device object 155,156 is performed hereafter, the unknown logical device object 134-2,134-3 is generated, advice of completion is published, and initialization of an unknown device class is completed.

[0274] The logical device management object 122 will be ended if generation initialization of the logic device-class object defined beforehand and generation initialization of the unknown logic device-class object following it are completed. If initialization finishes, the logical device management object 122 can reply to a device-class list demand from application. Before initialization is completed, the answer which cannot be used is returned to the inquiry from application.

[0275] Next, utilization of the device from application is explained. Here, taking the case of the case where a printer 90 is used, it explains from application.

[0276] In addition, it is Java about the interface between a physical device and a logical device. It is Java about between SPI, a logical device, and applications. It is referred to as API. In these, APIs between OS and Java differ.

[0277] The application program shall know the reference to the logical device object 131-1 corresponding to a printer 90 by predetermined approaches, such as an inquiry to OS.

[0278] For example, application knows beforehand the reference to the logical device management object 122, gains the reference to a printer class through the logical device management object 122, and receives the reference to a printer 131-1 from a printer class. Or the naming service about an equipment configuration may

be offered.

[0279] An application program publishes a printing demand to the logical device object 131-1 by making reference to a postscript file into an argument.

[0280] The logical device object 131-1 gets to know that it is a postscript file from the header information of a file, and develops a postscript file to a bitmapped image. And the logical device object 131-1 publishes a printing demand to the physical device object 151 by making reference to an object including information, such as paper size assignment of those other than a bitmapped image and a bit map, into an argument. In addition, it is desirable to perform queue processing by the logical device object 131-1.

[0281] The physical device object 151 transmits the bit map information corresponding to a printing image to a printer 90 through the device control object 161. That is, the flag which PC81 uses for the CSR register A with which the printer 90 was defined beforehand by the lock transaction is written in. If it succeeds in lock and the royalty of a printer is acquired, next, setting out of the Isochronous channel on the IEEE1394 bus for transmitting data and the transaction which sets up printers, such as paper size and tray information, will be published. If a channel is gained, bit map information will be transmitted and a transfer will be completed, the transaction of the completion of a transfer will be published and the printing directions to a printer will be completed. Since the printing situation in a printer is displayed on a certain CSR register, completion of printing is got to know when a physical device object polls it.

[0282] Next, utilization of the equipment registered as an unknown type is explained taking the case of message equipment 12.

[0283] Software structure when drawing 27 adds a logic device-class object, an example of the new device-class addition demand procedure according [ drawing 28 ] to application, and drawing 29 show an example of the new device-class addition procedure by the logical device management object 122, respectively.

[0284] Application publishes the list acquisition demand of logic device class to the logical device management object 122 (step S51). Acquisition of the reference to the unknown logic device-class object 134 requires list acquisition of a logical device of the unknown device class 134 (steps S52 and S53).

[0285] Application chooses the reference to the logical device object 134-1 corresponding to message equipment 92 from a list, and requires available logical device information (step S54).

[0286] The logical device object 134-1 acquires the attribute value from the physical device object 154, and publishes the retrieval demand of logic device class with the available physical device object 154 to the logical device management object 122. The logical device management object 122 has the table to which a logic device-class name is made to correspond from attribute value like previous statement. A logic device-class name or its list is returned to a logical device 134-1 from this table, and a logical device 134-1 acquires a logic device-class name to a demand, and notifies it to application as logical device information. Of course, it does not matter even if it carries out by asking the server on a network retrieval of a device-class name also here. It is desirable to store explanation by the object code of the default driver of message equipment and the natural language of directions in the storing location of a driver object at least.

[0287] Application chooses the logic device-class name "message equipment" to be used, and publishes a logic device-class registration demand to the logical device management object 122 (steps S55, S56, and S57).

[0288] The logical device management object 122 generates the new logic device-class object 135 corresponding to the specified class name (step S61), and inserts it between the unknown logic device-class object 134 and an unknown class, and the logic device-class object 133 of FAX linked (step S62). And the logical device object 134-1, 134-2 registered into an unknown device class until now is deleted (step S63), and an initialization demand is published to the logic device-class object 135 (step S64). This condition is shown in drawing 27. The procedure of future step S65 and step S66 and the initialization procedure of the new logic device-class object 125 are the same as that of what was already explained. In addition, 135-1 is the newly generated logical device object among drawing 27.

[0289] Here, although the example which searches the logical device corresponding to an unknown device was explained, a new corresponding logical device may be searched from the combination of the existing physical device. For example, it is a case so that available new logical device FAX may be searched with the combination of each physical device with the function of a printer, a scanner, and a modem.

[0290] By having the above-mentioned function, the unnecessary program for controlling the device which is not used usually is not read at the time of initialization of a system, but by reading, when needed, can save resources, such as memory of PC, and can reduce cost.

[0291] Next, the configuration change event of 1394 devices is explained.

[0292] The connection situation of 1394 equipments that PC can be used may change. And by IEEE1394 bus, a configuration can be changed by the insert and remove of a connector working. This modification result must be reflected in a logical device as an addition and deletion of a device object. Moreover, if occupancy of the device

by a certain equipment is completed, the device will become available with other equipments. Below, the procedure of recognizing change of such a configuration is explained.

[0293] Generating of bus reset notifies bus reset to the 1394 management object 121 from 1394 interfaces of OS. Again, the 1394 management object 121 acquires a list of 1394 physical units from TOPOLOGY\_MAP and SPEED\_MAP, and is those unique(s). ID is acquired and a response with a known device is taken.

[0294] First, the 1394 management object 121 makes "unknown" exist attribute value of all physical device objects after bus reset.

[0295] unique acquired from equipment unique which the physical device object of existing [ ID ] holds When in agreement with ID, the equipment is registered and already considers exist as "existence."

[0296] unique acquired from equipment unique which the physical device object of existing [ ID ] holds When not in agreement with ID, the equipment is equipment added newly, carries out generation initialization of the physical device object, and considers exist as "existence."

[0297] They are all NODE(s) about this actuation. After following ID, the physical device object to which exist is unknown deletes it as that from which corresponding equipment was removed. If a physical device object is deleted, it is notified to a corresponding logical device object, and after a logical device object performs a post process and notifies it to a corresponding device class, it will eliminate self.

[0298] If correction of reference by an addition and deletion is completed, the 1394 management object 121 will notify modification of a configuration to the logical device management object 122. Advice will not be performed if there is no change in a configuration.

[0299] The logical device management object 122 which received advice publishes a configuration change demand to each device class.

[0300] The printer class 131 which received the configuration change demand requires reference of a physical device of the logical device object 122 like initialization. It differs from initialization that only the physical device object newly added in the configuration change is applicable to all the physical device objects having been objects in initialization. Each logic device class reads the attribute of the physical device added newly, and if it judges whether it is in agreement with a self-class and is in agreement, it will generate and register a corresponding logical device object.

[0301] Completion of the configuration change of all classes registers the physical device object which initialization of an unknown class was performed and was not registered as which logical device with the added device into an unknown class.

[0302] Next, modification of an occupancy condition is explained.

[0303] In initialization, to the equipment which was judged to be in the occupancy condition by other nodes, and was excepted from recognition, the 1394 management object 121 performs periodic polling, and detects modification of a device occupancy condition by the readout of a register. The device which changed into the condition of not occupying is registered in the same procedure as change of the device configuration described by bus reset. If the PC concerned occupies said equipment exclusively, the value which shows it to the register in which the occupancy condition of equipment is shown for it will be written in.

[0304] Next, the case where a local logical device object is old is explained.

[0305] In such a case, the logic device-class object has the attribute of a version number. Application can publish the updating demand of a logic device-class object to the logical device management object 122. While the logical device management object 122 acquires the version number of the logic device-class object as which updating was required, it requires the newest version number of the archive server of the logic device-class object specified beforehand. If the version number of a local logic device-class object is in agreement with the newest thing and the version number of a local logic device-class object is young, the newest device class will be read from an archive server, and an object will be generated. This logic device-class object does not operate at this event.

[0306] If it succeeds in generation of an object, advice of termination will be published to the existing logical device, and actuation will be terminated. If it is a printer, reception of a new print job will be stopped and it will wait for termination of the print job under activation. Completion of an active job and a post process notifies completion to the logical device management object 122. The logical device management object 122 sends the advice of initiation of a logical device to a logic device-class object, after it changes the reference relation which an old logical device has and a new logical device object succeeds reference relation. The logic device-class object which received advice starts actuation.

[0307] (3rd operation gestalt) The case where the remote IEEE1394 equipment to which PC (thing with the function of the 2nd operation gestalt) connected to the network was connected via networks other than IEEE1394 is controlled by this operation gestalt is explained.

[0308] The example of the structure of a system which starts this operation gestalt at drawing 30 is shown.

401, 411, and 434 express PC in the 1st home 451, network connection equipment, and a toaster, respectively. 402, 412, 431, 432, and 433 express PC in the 2nd home 452, network connection equipment, a printer, FAX, and massage equipment, respectively. In addition, each component other than the network connection equipment in drawing 30 is the same as that of that to which it corresponds in drawing 1.

[0309] It shall be connected with the ISDN communication line 413 between LAN in a home 451, and LAN in a home 452. Termination of the communication line 413 is carried out with network connection equipment 411,412.

[0310] In LAN in a home 451, 1394 buses 421 connect between the contact 411, PC401, and the toaster 434.

[0311] In LAN in a home 452, 1394 buses 422 connect between a contact 412, PC402, a printer 431, a scanner 432, and massage equipment 433.

[0312] A network shall be the Internet using Internet Protocol and only PC401,402 and the contact 411,412 shall have an IP address beforehand. Although what was assigned fixed was assigned by protocols, such as DHCP and PPP, whichever is sufficient as an IP address.

[0313] Here, PC401 at a home 451 tries connection with the device of a home 452. PC401 sends the character string which shows a home 452 to network connection equipment 411 by Internet Protocol, for example, a connection request including "Yoshiaki Takahata" who is the name. And network connection equipment 411 has the database with which the telephone number of the home 452 corresponding to "Yoshiaki Takahata" is searched, and makes connection with the contact 412 of a home 452.

[0314] A contact 412 performs authentication of a connecting agency before connection. Connection shall not be made if a permission is not granted at an authentication step. Suppose authentication that the connection of those other than the telephone number registered beforehand at the 2nd home 452 is not accepted for example, using a dispatch telephone number display. If connection is completed, the communication link by Internet Protocol can be performed between homes 451,452.

[0315] However, even if connection is completed from a viewpoint of security protection, it is desirable to operate as the so-called fire wall a contact judges good/failure of passage of a packet to be by the policy of the home. Here, it shall be set up so that all packets may pass beforehand between a home 451 and a home 452 and all actuation can be performed.

[0316] In addition, this connection may be not connection but the IP connection by the telephone.

[0317] Now, PC401 at a home 451 acquires the address of a service management server from the database of a contact 411. The address shall be beforehand registered into the contact 411. Next, PC401 asks a service management server available service. Here, network connection equipment 412 shall serve as a service management server.

[0318] A service management server answers an inquiry and returns the service in the network concerned, and the information on the server. Here, the next service is registered.

[0319] printer:pc2Java The train of ORB:pc2 left expresses the multiplexing identifier (for example, port number) assigned to service the classification of service, and here, and a right train expresses the IP address of PC402 the location of service, and here. Such a service information offer means is known as a service location protocol in the Internet (for example, reference "Internet draft draft-ietf-srvloc-protocol-16.txt").

[0320] These are registered into the host who offers service, and the network connection equipment 412 with which PC402 was beforehand defined here at the time of starting.

[0321] printer expresses the printing service defined by the Internet criterion, and the UDP/TCP number of 515 is assigned. The protocol used here is beforehand prescribed by the Internet criterion.

[0322] Java ORB expresses the service which can use a Java object from the outside. Such service is Java here, although not specified as a criterion yet now. There shall be agreement beforehand about the port number showing ORB.

[0323] Next, how to use through the approach approach 2 1394 proxy object used through the network service standardized by the approach [ two kinds of ] and approach 1 Internet using 1394 equipments of RIMOTO is explained.

[0324] By the approach 1, the printer 431 connected to PC402 by the IEEE1394 interface is used by printer service standardized as Internet Protocol. PC401 has the client of a printer protocol and delivery and a printer are used for PC402 for a printing demand of the format which specified the logic name showing a printer 431 and was standardized in the Internet format. The element of device dependence is not contained in the message which transmits a network by this approach. The application of PC401 only specifies and requires the identifier of the equipment corresponding to printer service and a printer 431, and he is not conscious of the property of equipment.

[0325] Roughly, an approach 2 uses the format that the packet of an IEEE1394 format was encapsulated by the IP packet for the message which transmits a network. PC401 can be used as if the printer 431 was connected

to 1394 local buses.

[0326] Hereafter, it explains in more detail about the above-mentioned approach 2.

[0327] The software structure of the service via a network before connection of a client side is shown in drawing 31, the software structure of the service via a network after connection of a client side is shown in drawing 32, the software structure of the service via a network before the connection by the side of a proxy is shown in drawing 33, and the software structure of the service via a network after the connection by the side of a proxy is shown in drawing 34. In addition, each component other than IP function in drawing 31 - drawing 34 has the same function as that to which it corresponds in drawing 2. The IP functions 504 are many functions of a series of Internet Protocol (TCP/IP protocol sheet), such as TCP/UDP/IP.

[0328] Drawing 31 is the software configuration of the client PC 401 before 1394 stub object generation. The function manager of each hard disk with which a logical device function manager and 502 have in a secondary storage function manager, and 501 has 511,512 to the subordinate of 502, 1394 interface management functions and 513,514 503 Each 1394 interface-management function, unit1,521 in 504 IP function and 434 indicate a toaster and 509 indicates toaster ability to be A 1394 management object, 522 corresponds to a logical device management object, and 531,532,533,534 corresponds to a printer, a scanner, message equipment, and each unknown logic device-class object. 534-1 is the logical device object of an unknown class. 551 expresses the physical device object corresponding to a toaster 434. 561 expresses the driver object (control program) corresponding to the physical device object 551.

[0329] Drawing 32 is the software configuration of the client PC 401 after 1394 stub object generation, and the 1394 stub object 571, the logical device object 533-1,533-2, the physical device object 551, and the driver object 562,563 are added to the configuration of drawing 31.

[0330] Drawing 33 is a software configuration by the side of [ PC / 402 ] a proxy before 1394 proxy object generation, in each 1394 interface-management function and 431, a printer and 432 express FAX and 433 expresses [ the function manager of each hard disk with which a logical device function manager and 602 have in a secondary storage function manager, and 601 has 611,612 to the subordinate of 602, and 603 / 1394 interface management functions and 613,614 ] message equipment, respectively. A 1394 management object and 622 621 A logical device management object, The logic device-class object corresponding to a printer, a scanner, FAX, and each unknown device class in 631,632,633,634, 651 and 652,653,654,655, respectively unit1 of a printer (604 in drawing), unit1 (605 in drawing) and unit2 of FAX (606 in drawing), unit1 of message equipment (607 in drawing), The physical device object corresponding to unit2 (608 in drawing) and 631-1,631-2,632-1,633-1,634-1,634-2 are logical devices which the subordinate of logic device class has, respectively. 661,662,663 expresses the driver object corresponding to the physical device object 651,652,653, respectively.

[0331] Drawing 34 is a software configuration by the side of [ PC / 402 ] a proxy after 1394 proxy object generation, the 1394 proxy object 681, the logic device-class object 635, and the logical device object 635-1,635-2 are added to the configuration of drawing 33, and the logical device object 634-1,634-2 is deleted.

[0332] PC401 specifies the IP address of PC402 of RIMOTO based on service information, and generates the 1394 stub object 571. A 1394 stub object is Java of PC402 of RIMOTO. The class name assigned to the 1394 proxy object is specified as an ORB port, and the generation is required.

[0333] A certain host to another host's Java When using ORB, it judges whether the security manager of a receiving side allows the connection. This shall be automatically performed by the utilization demand of ORB by the object of a transmitting side.

[0334] Here, the ORB utilization demand from PC401 should be received with PC402, in PC402, the 1394 proxy object 681 is generated as a demand, and the reference is returned to the 1394 stub object of PC402. The 1394 stub object 571 performs future demands through the 1394 proxy object 681. In addition, ORB which can use only the method which generates the 1394 proxy object 571 beforehand before PC's402 requiring, and can be started from the object concerned may be assigned to the port considered as 1394 services. This is effective to offer the service limited to 1394.

[0335] If reference is received, the 1394 proxy object 681 will gain the reference to the physical device corresponding to the logical device of an unknown class, and will notify it to the 1394 stub object 571.

[0336] If above reference is gained, the 1394 stub object 571 will register the 1394 management object itself into the 1394 management object 522, and will publish the demand which reconfigurates 1394 devices.

[0337] By this demand, the 1394 management object 522 starts reconstruction by the 1394 proxy object 681, and requires the reference to a physical device object. A 1394 stub object passes the reference 654,655 to the physical object gained from 571 and the 1394 proxy object 681 in order to the 1394 management object 521.

Taking out attribute value from here, the 1394 management object 521 creates the physical device object 552,553 in the same procedure as the case of initialization explained with the 2nd operation gestalt. However, the physical device object (it is hereafter called a stub device object) created here holds the reference to a

remote \*\*\*\*\* physical device object, and it differs in a local physical device object in that the I/O processed as a transaction request to 1394 interfaces is processed as I/O between the 1394 stub objects 571 by the stub device object (in addition, the detail is mentioned later).

[0338] Next, initialization of the logic device-class object 533 by the logical device management object 522 and initialization of the logical device object following it are performed. The stub object 552,553 corresponds to the physical device object 654,655, and agrees in message device class. In PC402 of RIMOTO, since message device class is not used, these equipments are recognized as unknown equipment, but since message device class is registered in local PC401, it is registered as a logical device object 533-1,533-2.

[0339] If an initialization demand is given to the stub object 552 from the logical device object 533-1, the activity demand of the physical device object 654 corresponding to the 1394 proxy object 681 of RIMOTO will be published.

[0340] The 1394 proxy object 681 of RIMOTO generates and registers the logic device-class object 635 of a proxy class. The logical device object 634-1 corresponding to the physical device object 654 is eliminated, the device of a proxy class is built, and it registers as a proxy logical device object 635-1.

[0341] If the proxy logical device object 635-1 is generated, a port number will be assigned between the stub objects 533-1, and a logic connection will be generated. The port used here is Java. ORB is for transmitting 1394 packets using another port.

[0342] A control program is read, the stub object 552 side of local PC401 operates, the physical device object of PC401 of RIMOTO outputs the packet inputted from the port to 1394 interfaces, the packet inputted from 1394 interfaces is only transmitted to a port, and the control program 562 of the stub object 552 performs state control of equipment. However, events, such as bus reset, transmit.

[0343] The same is said of the case where an initialization demand is given to the stub object 553 from the logical device object 533-2.

[0344] The made environment where the physical device of RIMOTO can be used from a local logical device is ready with the above procedure.

[0345] Next, actuation is explained. Here, it explains taking the case of the physical device object 552 of a stub.

[0346] The physical device object 552 receives a processing demand from the logic device driver 531-1, and generates the packet of 1394 formats corresponding to it. The packet of 1394 formats is encapsulated by the IP packet and outputted to said logic connection who secured.

[0347] Here, the direct output of the output from the physical device object 552 is processed through the IP function 504 from a logic connection rather than it is carried out to the IEEE1394 interface 503.

[0348] Here, this may be Ethernet and ATM although the point of the IP function 504 is processed by the IEEE1394 interface. That is, PC without an IEEE1394 interface can also control as if IEEE1394 equipment was connected locally.

[0349] Now, proxy logical device OBUJIEKU 635-1 is reached, the packet of 1394 formats is taken out, and the packet encapsulated by the IP packet is passed to the physical device object 654. Physical device OBUJIEKU 654 outputs this to 1394 interfaces as it is, and acts on the register of equipment 433.

[0350] I/O of the isochronous channel of IEEE1394 cannot be relayed by the above-mentioned approach. It sets to IEEE1394 and he is IEC. An isochronous channel is set up by operating a register by the method defined by 1883.

[0351] The setting-out demand of IEC1883 published by self-equipment from the stub object 552 is transmitted 1394 stub object 571, and the 1394 stub object 571 sets up the connection on the Internet corresponding to an isochronous channel.

[0352] The band to secure can be specified by the isochronous channel of IEEE1394. Since the information is included in the above-mentioned setting-out demand, it is desirable to specify a connection's band with a means, for example, means, such as RSVP, to secure a band on the Internet.

[0353] In addition, although connected with this operation gestalt by the ISDN communication line 413 between LAN in a home 451, and LAN in a home 452 Connection between LAN in a home 451 and LAN in a home 452 is made the Internet like the 1st operation gestalt. In this case, may make it use a global IP address for the IP address of a terminal, and For example, address translation, such as NAT (Network Address Translation), is used. When a public network 2 is the Internet, a global IP address is used for the node ( drawing 1 AV contact terminal) which interconnects a network at least, and you may enable it to use a private IP address for other nodes.

[0354] In addition, each above function is realizable also as software. Moreover, it can also carry out as a medium which recorded the program for making a computer perform each above-mentioned procedure or the above-mentioned means and in which machine read is possible.

[0355] This invention is not limited to the gestalt of operation mentioned above, in the technical range, can deform variously and can be carried out.

[0356] The service provision equipment with which it held in the 2nd home network to the 1st AV contact 4 with the 1st operation gestalt as shown in drawing 12 (4th operation gestalt) (For example, the WWW server, the digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10) The case where a service location protocol was used although the information (it is hereafter called service information simply) about the service which a printer 11 offers is notified was shown.

[0357] The 4th operation gestalt explains the case where this is performed with a WWW (World Wide Web) server using a homepage.

[0358] The example of a system configuration in the 4th operation gestalt is the same as that of drawing 1. Here, it considers performing remote control of the various service provision equipments in the 2nd domestic network (printers 11, such as a WWW server, a digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10) from the 1st AV contact 4 of the 1st domestic network like the 1st operation gestalt.

[0359] Drawing 35 is the thing in the 4th operation gestalt which showed the example of an internal configuration of the 2nd AV contact 5, actuation of each part of 1394 I/F1401, the data link switch 1402, public network I/F1403, the IP processing facility 1404, the FANP processing facility 1405, and the 1394AV command-processing function 1408 is the same as that of the same function part of drawing 2, and a different point is explained. That is, the service location processing facility 27 of drawing 2, and 1394 / IP command conversion function 29 are transposed to the homepage processing facility 1407 and the HTTP/RTSP processing facility 1409 by drawing 35, respectively.

[0360] The 1394/IP service location processing facility 1406 has the function which notifies service information outside if needed, when it has recognized what kind of service the service which the service provision equipment connected to the IEEE1394 bus offers like the 1st operation gestalt is searched, or the registration is received, and what kind of service provision equipment exists on 1394 buses, and is offered and it is required. Moreover, it notifies to the homepage processing facility 1407 which mentions later the service information for every service provision equipment obtained by doing in this way, and creation of the homepage which displays the situation of the 2nd domestic network is urged.

[0361] The homepage processing facility 1407 has WWW server ability. From the 1394-/IP service location processing facility 1406, reception and it are summarized for the service information on the 2nd domestic network as a homepage. For example, the icon and character string showing each service provision equipment are arranged on a homepage. And it is made to link to the icon and character string showing each service provision equipment on the homepage corresponding to each for the command for carrying out remote control of each service provision equipment. Thus, when the created homepage has access through a public network 2, the homepage demanded if needed is transmitted or the command for remote control received through the public network 2 is transmitted to the HTTP/RTSP processing facility 1409. It mentions later for details.

[0362] Here, with the command for carrying out remote control of the service provision equipment, it is suitable for HTTP or RTSP (protocol for operating the real-time media in a WWW server by remote control). The command for remote control which was suitable for the HTTP command and RTSP in the command for remote control suitable for HTTP is called the RTSP command.

[0363] The HTTP/RTSP processing facility 1409 has the HTTP demon or the RTSP demon inside. With the function to perform processing to the HTTP command or the RTSP command transmitted from the homepage processing facility 1407 In being what is assigned to the service which the 2nd AV contact 5 serves as a deputy, and the destination of the command exhibits It is changed into an IEEE1394 command if needed, and it also has the function (deputy processing) which controls the device on 1394 buses 3 through the 1394AV command-processing function 1408.

[0364] Next, in the 2nd domestic network, the procedure which acquires the service information on each service provision equipment that the 2nd AV contact 5 was connected to the 2nd domestic network is explained. This is the same as that of the 1st operation gestalt. That is, as shown in drawing 3, the 2nd AV contact 5 is with reading the configuration memory of the connected device (the DVD player 8, digital VTR 9, PC10, printer 11), and using a service location protocol, as shown in drawing 9, and acquires the service information on the service provision equipment connected to the 2nd domestic network.

[0365] In addition, the information included in configuration memory may have drawing 4, drawing 5, and a thing like drawing 6. Moreover, service information may be registered in the format shown in drawing 10.

[0366] Now, the 2nd AV contact 5 recognizes the DVD player 8, digital VTR 9, PC10, and a printer 11 as 1394 nodes through reading of configuration memory at this event. Moreover, each of WWW service, digital album service, Aircon Service, and microwave oven service is further recognized through a service location protocol.



Here, it is recognized as it being the service which is provided with the 2nd AV contact 5 and provided with Aircon Service and microwave oven service with PC10.

[0367] Now, the 2nd AV contact 5 creates the homepage "introduces what there is in that house (what kind of service [ what kind of service provision equipment and ] exist?)" based on these collected service information.

[0368] The homepage created enumerates icons, character strings, etc. showing them for every service provision [ to make it recognize / a user ] equipment, as shown in drawing 36 R> 6. This homepage may build this so that it can reach by the hyperlink from an icon in a saying in the first homepage which the WWW server of that house introduces by the default, for example (for example, "the electrical machinery and apparatus of my home") character string. Incidentally, in case it moves to the homepage of this "electrical machinery and apparatus of my home", passing through a certain authentication procedure is desirable so that it may not be invaded by others who have not got authorization.

[0369] When the icon in a homepage as shown in drawing 36 , and a character string are clicked, it is made for the service provision equipment corresponding to it or the homepage for every service to appear. For example, you may make it a click of the icon of the DVD player of drawing 36 display "the homepage of a DVD player" as shown in drawing 39 linked to it.

[0370] In order to create a homepage as shown in drawing 36 of such a configuration, the homepage processing facility 1407 completes a procedure as shown in the flow chart of drawing 37 .

[0371] First, it reads one [ at a time ] the service information registered into 1394 / IP service location processing facility 1406 for example, for every service provision equipment, and the homepage (for example, "homepage of a DVD player" as shown in drawing 39 ) for every service provision equipment is created (step S101 - step S102).

[0372] The flow chart shown in drawing 38 shows the homepage creation procedure for every service provision equipment of step S102.

[0373] With reference to the table 1410 (refer to drawing 50 ) corresponding to a RTSP command for every service provision equipment provided in 1394 / IP service location processing facility 1406, the command group (command group for control of the service provision equipment which lets a homepage pass and is opened to a user) as which each service provision equipment was determined beforehand is acquired (step S111), and the icon or character string corresponding to it is created for every command (step S112). For example, when service provision equipment is a DVD player, the RTSP command "PLAY" for directing "playback" is acquired from the table corresponding to a RTSP command of drawing 50 R> 0, and the icon (icon i206 of drawing 39 ) corresponding to the command is created.

[0374] As for the table 1410 corresponding to a RTSP command, the RTSP command is described for every service provision equipment. For example, in the case of the DVD player 8, as a command group, each RTSP command of power-source ON, power-source OFF, playback, rewinding, front music, a rapid traverse, the following music, a halt, and a halt is mentioned. Moreover, the case of the DVD player 8 which is performing deputy processing with the 2nd AV contact 5, and digital VTR 9 is having both 1394 commands corresponding to each RTSP command memorized as shown in drawing 50 .

[0375] In addition, the table 1410 corresponding to a RTSP command may be the same as the table provided in 1394 / IP command conversion function 1423 of drawing 42 mentioned later.

[0376] Now, the RTSP command of the service provision equipment is matched with the icon or character string created at step S112 (step S113). For example, the RTSP command "PLAY" is made to correspond to the icon i206 of "playback" of drawing 39 . For example, an icon or a character string, and the RTSP command corresponding to it may be registered into a table.

[0377] in addition, the case of the DVD player 8 which is performing deputy processing with the 2nd AV contact 5, and digital VTR 9 -- the address of the 2nd AV contact 5, the DVD player 8, and digital VTR 9 -- the port number assigned to each IEEE1394 node is included in the RTSP command.

[0378] The homepage of service provision equipment as performed the above to all the commands that the service provision equipment offers, and arranged the created icon or character string suitably, for example, shown in drawing 39 is created (step S114 - step S115).

[0379] Next, the icon or character string of the service provision equipment with the hyperlink to the homepage for every service provision equipment created by explanation of drawing 37 according to the flow chart of return and drawing 38 is created or acquired (step S103). That is, the icon for every service provision equipment etc. may be taken out from the configuration memory of that service provision equipment, and may come to hand in the form which goes for URL which can be specified as a meaning to be offered by the service location protocol, and to take the location of this icon with it there.

[0380] The icon obtained at step S103 is stuck on the homepage of "the electrical machinery and apparatus of my home." It holds in the 2nd domestic network, the above procedure is performed about the service provision



equipment of all \*\*\*\*\*, and a homepage like drawing 36 can create it (step S104).

[0381] Now, if it clicks on the icon i101 which expresses a DVD player among the icon showing the service provision equipment on the homepage shown in drawing 36, or a character string, the homepage of the service provision equipment matched with this icon, i.e., the homepage of a DVD player as shown in drawing 39, will appear.

[0382] The homepage of a DVD player can be used as a control panel of a DVD player in the homepage of service provision equipment as shown in drawing 39, i.e., this case, and a user can do remote control of the DVD player 8. For example, when a "power-source ON" carbon button is clicked, it is condition that the power source of the DVD player 8 is turned on.

[0383] Next, it explains with reference to the sequence diagram showing the processing actuation in the case of carrying out remote control of the various service provision equipments in the 2nd domestic network (printers 11, such as a WWW server, a digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10), through the 1st AV contact 4 and a public network 2 from PC6 of the 1st domestic network in drawing 4040, for example.

[0384] Suppose that the homepage as shown in drawing 36 was shown by using a predetermined WWW browser with PC6 held in the 1st domestic network. The HTTP message as which he will demand the homepage of the DVD player by which the response price was carried out to it if a user clicks on the icon of the DVD player i101 is outputted from PC6.

[0385] In response to this message, the sending-out demand of the homepage of DVD is performed to the 2nd AV contact 5 with the 1st AV contact 4 (step S4501). For example, the message "GET/appliances/dvd.html HTTP/1.1" is transmitted to the 2nd AV contact 5 from the 1st AV contact 4.

[0386] In response, the 2nd AV contact 5 sends the text (refer to drawing 41) of the homepage of a DVD player as shown by drawing 39 to the 1st AV contact 4 (step S4502).

[0387] As shown in drawing 41, the hyperlink given to the "reproductive" icon i206 is the "PLAY" command of RTSP for directing playback, and the node used as the connection place, in the case of this operation gestalt the IP address of the 2nd AV contact 5, i.e., "192.168.1.254", and its port number (in the case of this operation gestalt "2000") are added. If it clicks on the "reproductive" icon i206 by doing in this way, a user can send out the "PLAY" command of RTSP to the port of a request of a desired node, without caring about the address of a transmission place. It can have and remote control using RTSP can be performed now through correlation of a hyperlink.

[0388] Now, the user of 1st AV contact can start remote operation of a DVD player, if the homepage of DVD is received. For example, suppose that it clicked on the icon i201 of the "power source ON" of the homepage of drawing 39 (step S4503). For example, the "SETUP" command of RTSP is matched with the icon i201 of "a power source ON" by the hyperlink. Therefore, "SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport : It is with rtp/udp;port=5500" and command data are transmitted to the 2nd contact 5 from the 1st AV contact 4 (step S4504). With this command data, the 1st AV control device 4 transmitted data using each protocol of RTP/UDP, and is requiring that the port number of a receiving side should use "5500."

[0389] Actuation of the 2nd AV contact 5 which received this is explained below. The example of an internal configuration of HTTP / RTSP processing facility 1409 of 2nd AV contact is shown in drawing 42. The "SETUP" command data of Above RTSP reach the HTTP/RTSP main processing facility 1421. Here, first, among "SETUP" command data, it recognizes that a port number "2000" is a port number currently assigned to the DVD player 8 which is 1394 nodes, and control is passed to the RTSP redundancy 1422.

[0390] With reference to the table in the 1394-/IP command conversion function 1423, the RTSP redundancy 1422 finds a corresponding 1394 AV/C command (AV/C command which means power-source ON in the case of this operation gestalt), and publishes the above-mentioned AV/C command through the 1394AV command-processing function 1408 to 1394 corresponding nodes (in the case of this operation gestalt DVD player 8) (step S4505).

[0391] If it succeeds in this, the 2nd AV contact 5 sends out "O.K." command data (for example, "RTSP/1.0 200 1 - Session: 1234") of RTSP which means the completion of control to the 1st AV contact 4 (step S4506). In that case, the session number (in the case of this operation gestalt "1234") is added to the RTSP command as a number of a meaning through this session. The browser of the 1st AV contact 4 adds a session number "1234" to a command, when holding this session number and publishing the RTSP command to the same equipment below.

[0392] Next, a user presupposes that it clicked on the icon i206 of "playback" of the homepage of drawing 39 (step S4507). For example, the "PLAY" command of RTSP is matched with the "reproductive" icon i206 by the hyperlink. Therefore, the command data "PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234" are transmitted from the 1st AV contact 4 to the 2nd AV contact 5 (an IP address "192.168.1.254", a port number

"2000", session number "1234") matched by this hyperlink (step S4508).

[0393] It executes the "PLAY" command to reservation (step S4509) of the synchronous channel by IEC1883, and the DVD player 8 of a 1394 AV/C protocol in order to urge playback of the DVD player 8 to the 2nd AV contact 5 which received this (step S4510), and sending out to the synchronous channel in which image data carried out [ above-mentioned ] reservation is urged to it. And when the "ACK" signal of the purport which transmitting preparation of image data completed is received from the DVD player 8, the 2nd AV contact 5 transmits "O.K." command data ("RTSP/1.0 200 2 - Session:1234") of RTSP to the 1st AV contact 4 (step S4511 - step S4512).

[0394] Then, the 2nd AV contact 5 carries out IP capsulation of the image data sent through this synchronous channel, and sends them out to the 1st AV contact 4 as an IP packet (step S 4513-4515).

[0395] The 1st AV contact 4 receives the above-mentioned image data as an IP packet, and performs required processings, such as a display of an image. When making the sending-out place of an image digital [ TV / 7 ] Reservation of the required synchronous channel on IEEE1394 which is the 1st domestic network, and the 1st AV contact 4 receive digital [ 7 ] one TV like the 1st operation gestalt. What is necessary is just to send out to the 1st domestic network, after directing a display on the screen of the data reception and its data from this synchronous channel and changing the above-mentioned image data into ejection and the format for IEEE1394 from a receiving IP packet.

[0396] In addition, even when the user clicks on the "reproductive" icon i206 before clicking on the icon i201 of the "power source ON" of the homepage of drawing 39, the user judges that there is volition of actuation of the DVD player 8, and sends out both the "SETUP" command and the "PLAY" command in response to the click of the "reproductive" icon i206.

[0397] Moreover, when opening the homepage of a DVD player, the "SETUP" command of a DVD player is sent out as a RTSP command.

[0398] It is based on the service information collected from all the service provision equipments in which remote control held in the 2nd domestic network is possible as explained above. The 2nd AV contact 5 With reference to the table 1410 corresponding to a RTSP command, the RTSP command of each service provision equipment and the homepage which carries the linked icon are created. When it clicks on a desired icon by the 1st AV contact 4 side which accessed this homepage, The RTSP (it registers with table of 1394-/IP command conversion function 1423 of HTTP/RTSP processing facility 1409) command matched with the icon by the hyperlink By being changed into 1394AV(s) / C-command, and performing desired control to desired service provision equipment Remote control will become possible even when the service provision equipment (for example, DVD player 8) connected to the 2nd physical network (for example, IEEE1394 bus 3) can interpret only the protocol depending on a data link layer (if AV contact of this invention is used).

[0399] Now, the above explained the case where the 2nd AV contact 5 encapsulated and sent out image data to an IP packet. On the other hand, the 2nd AV contact 5 does not perform IP capsulation, but how to send out image data to the 1st AV contact 4 with non-IP data is also considered. In this case, it explains with reference to the sequence which is attached and is shown in drawing 43.

[0400] The user of the 1st AV contact 4 of step S4801 - step S4802 is the same as that of explanation of drawing 40 until he begins remote operation of reception and a DVD player for the homepage of a DVD player.

[0401] For example, suppose that it clicked on the icon i201 of the "power source ON" of the homepage of drawing 39 (step S4803). For example, the "SETUP" command of RTSP is matched with the icon i201 of "a power source ON" by the hyperlink. Therefore, "SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport : The "SETUP" command data of RTSP called iec1883 / nonip;port=FANP" are transmitted to the 2nd contact 5 from the 1st AV contact 4 (step S4804). It is being required that the 1st AV control device 4 should encapsulate data in IEC1883, and should transmit them with this command data in the form which is not an IP packet (the information of "iec1883/nonip" for directing non-IP packet-ization is included in [SETUP [ namely, ]" command of RTSP). Moreover, in order to know the link layer information and attribute information on the data transmitted, it is being required from the 2nd AV contact 5 that the above-mentioned information should be notified to the 1st AV contact 4 using FANP.

[0402] The "SETUP" command data of RTSP are received by the HTTP/RTSP processing facility 1409 of the 2nd AV contact 5, and reach the HTTP/RTSP main processing facility 1421.

[0403] In the HTTP/RTSP main processing facility 1421, it recognizes that a port number "2000" is a number currently assigned to the DVD player 8 which is 1394 nodes, and control is passed to the RTSP redundancy 1422.

[0404] With reference to the table in the 1394-/IP command conversion function 1423, the RTSP redundancy 1422 finds a corresponding 1394 AV/C command (AV/C command which means power-source ON in the case of this operation gestalt), and publishes the above-mentioned AV/C command through the 1394AV command-

processing function 1408 to 1394 corresponding nodes (in the case of this operation gestalt DVD player 8) (step S4805).

[0405] If it succeeds in this, the 2nd AV contact 5 sends out "O.K." command data (for example, "RTSP/1.0 200 1 - Session: 1234") of RTSP which means the completion of control to the 1st AV contact 4 (step S4806). In that case, the session number (in the case of this operation gestalt "1234") is added to the RTSP command as a number of a meaning through this session. The browser of the 1st AV contact 4 adds a session number "1234" to a command, when holding this session number and publishing the RTSP command to the same equipment below. The session number which a browser holds is updated by reference of the hyperlink corresponding to termination of the explicit session by the user, for example, session termination, termination of the session by the 2nd AV contact 5 of the pair opposite side, or reloading of a page.

[0406] Next, a user presupposes that it clicked on the icon i206 of "playback" of the homepage of drawing 39 (step S4807). For example, the "PLAY" command of RTSP is matched with the "reproductive" icon i206 by the hyperlink. Therefore, the command data "PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234" are transmitted from the 1st AV contact 4 to the 2nd AV contact 5 (an IP address "192.168.1.254", a port number "2000", session number "1234") matched by this hyperlink (step S4808).

[0407] It executes the "PLAY" command to reservation (#X) of the synchronous channel by IEC1883, and the DVD player of a 1394 AV/C protocol in order to urge playback of the DVD player 8 to the 2nd AV contact 5 which received this, and sending out to the synchronous channel in which image data carried out [ above-mentioned ] reservation is urged to it (steps S4809-S4811). And when the "ACK" signal of the purport which transmitting preparation of image data completed is received from the DVD player 8, the 2nd AV contact 5 transmits "O.K." command data ("RTSP/1.0 200 2 - Session: 1234") of RTSP to the 1st AV contact 4 (step S4811 - step S4812).

[0408] Then, IP capsulation does not perform the image data sent through this synchronous channel (#X), but the 2nd AV contact 5 encapsulates a public network as it is, and sends it out to the 1st AV contact 4. For example, as long as a public network is an ATM network, IEC1883 packet transmitted to the 2nd AV contact 5 may be mapped and sent out to an ATM network as it is, IEC1883 packet may be removed once, and the image data itself may be mapped and sent out to an ATM network. make it any -- in order to notify the header information of the link layer which the 2nd AV contact 5 sends out to the 1st AV contact 4, a FANP message "FANP message (ch: #y, Session:1234)" is sent out (step S4813).

[0409] In order to clarify that how to use a FANP message is FANP corresponding to the session number notified in step S4812 although it is the same as that of the 1st operation gestalt fundamentally, the session number (in the case of this operation gestalt "1234") of the same value as the value notified at step S4812 may be contained in this FANP message. By making it this appearance, the receiving-side node 4, i.e., 1st AV contact, can recognize that a FANP message is a thing corresponding to the "PLAY" command of said RTSP.

[0410] Now, if the image data sent by the synchronous channel (#X) from the DVD player 8 are outputted to a public network 2 in the 2nd AV contact 5, without carrying out IP capsulation, required processings, such as a display of an image, will be performed in the 1st AV contact 4 which received it (steps S4814-S4816). As it is in step S4815 in that case, MPEGover1394 to MPEGoverATM etc. may perform required format conversion, when the data transmission approach depending on the network transmitted is specified. Moreover, when making the sending-out place of an image digital [ TV / 7 ], it is also the same as that of the above-mentioned case.

[0411] Although the above operation gestalt [ 4th ] has explained the case where the RTSP command for carrying out remote control of the service provision equipment to the icon or character string in a homepage is made to correspond in a hyperlink To the icon in the homepage corresponding to each RTSP command, or each of a character string, instead of making it correspond in a hyperlink When the program (for example, JAVA (trademark) program) for creating corresponding RTSP command data is stuck and the icon or character string is clicked The RTSP command which starts this program with the 1st AV contact 4 (for example, JAVA virtual machine on the 1st AV contact 4), and was explained by drawing 40 or drawing 43 is sent out.

[0412] The processing actuation in this case is the same as that of drawing 40 and drawing 43, and text description of the homepage of the service provision equipment transmitted from the 2nd AV contact 5 at step S4504 of drawing 40 and step S4802 of drawing 43 differs.

[0413] An example of the text of the homepage of service provision equipment is shown in drawing 44. The program which is the text of the homepage of a DVD player, for example, generates the RTSP command to the icon i206 of "playback" of drawing 39 is added to drawing 44.

[0414] Too, if it clicks on the "reproductive" icon i206 also in this case, by starting the program which generates the "PLAY" command of RTSP, that command can be sent out now to the port of a request of a desired node, it can have it in it, and remote control of the service provision equipment using RTSP can be carried out.

[0415] Next, the icon (carbon button) i210 of "detail setting out" of the homepage of drawing 39 is explained. This carbon button is used to perform actuation finer than remote control beforehand defined by the RTSP command to target service provision equipment (for example, DVD player 8). That is, the control command of the DVD player 8 specified with the AV/C protocol of IEEE1394 may be various from the command specified by RTSP. Thus, if the homepage which performs this is separately set up as a cure in the case of the ability to respond to no commands of 1394 AV/C by the RTSP command and the carbon button of "detail setting out" of drawing 39 is pushed, it was matched with it, for example, the command "GET /appliances/dvd\_detail.html HTTP/1.1" will be sent out and the homepage for detail setting out of a DVD player as shown in drawing 47 will be sent.

[0416] Drawing 45 shows the creation procedure of the homepage for detail setting out of service provision equipment. That is, the table corresponding to the native command which registered the command (native command) depending on the link layer method (AV/C protocol of IEEE1394 when it is this operation gestalt) of the service provision equipment on which the response is not made on the command table 1410 for every above-mentioned service provision equipment is separately provided in 1394 / IP service location processing facility 1406. With reference to a native command table, a native command is acquired for every service provision equipment (step S121), and the icon or character string corresponding to it is created for every command (step S122). A CGI (Common Gateway Interface) script is matched with the generated icon or character string (step S123). The homepage for detail setting out of service provision equipment as performed the above to all the native commands of the service provision equipment, and arranged the created icon or character string suitably, for example, shown in drawing 47 is created (step S124 - step S125).

[0417] In addition, the table corresponding to a native command may be the same as the table in the CGI processing facility 1424 provided in the HTTP/RTSP processing facility shown in drawing 42.

[0418] Some carbon buttons (an icon or character string) arranged at the homepage for detail setting out of the DVD player of drawing 47 are matched with the CGI script processed by the CGI (Common Gateway Interface) processing facility in the 2nd AV contact 5. And each CGI script is the script which sends out AV/C-command of corresponding IEEE1394 to the IEEE1394 bus of the 2nd domestic network, and it has, and if the above-mentioned icon or a character string is clicked, grain size defined with the AV/C protocol can be controlled.

[0419] Thus, if the homepage for detail setting out is created and the icon or character string in the homepage is clicked, the demand message for starting the CGI script in the 2nd AV contact 5 which swerved, and was been and matched is transmitted in HTTP, in response to it, with the 2nd AV contact 5, this CGI script will be started and a corresponding AV/C command will be published.

[0420] the thing to which drawing 46 is transmitted from the 2nd AV contact 5 and which showed an example of text description of the homepage for detail setting out of a DVD player, for example -- it is -- the character string of "slow playback" of drawing 47 -- a CGI script -- a response -- the price -- the \*\*\*\*\* case is shown.

[0421] Although the RTSP command will be published like step S4508 of the above-mentioned drawing 40 if it chooses "usually reproducing" by the homepage for detail setting out of the DVD player of drawing 47 About the command which is not supported by RTSP, such as "language selection" and "slow playback" In the CGI processing facility 1424 provided in HTTP / RSTP processing facility of the 2nd AV contact 5, the corresponding CGI script is started and a corresponding AV/C command is published through the 1394AV command-processing function 1408.

[0422] For example, when "slow playback" is chosen by the homepage shown in drawing 47, the message "dvd/slowplay.cgi HTTP [ GET http://192.168.1.254/]1.1" for starting the CGI script corresponding to this is turned and sent out to the 2nd AV contact 5. In the 2nd AV contact 5 which received this, since the command of "slow playback" is not supported by RTSP, in the CGI processing facility 1424 provided in a HTTP/RSTP processing facility, the corresponding CGI script is started and a corresponding AV/C command is published through the 1394AV command-processing function 1408.

[0423] It is easy to be natural, even if the icon or character string corresponding to the RTSP command, and the icon or character string corresponding to a CGI script may be intermingled in the homepage for detail setting out of service provision equipment and the homepage consists of only the icons or character strings corresponding to a CGI script. For example, "playback" carbon button of drawing 47, the carbon button of "a power source ON" and "a power source OFF", etc. may be realized by a JAVA program etc. in the hyperlink about the command in the table corresponding to a RTSP command, and you may realize in CGI about other detail commands, such as "selection language" and a "title."

[0424] moreover, all the carbon buttons arranged at the homepage for detail setting out of drawing 47 are registered into the table corresponding to a native command -- having -- \*\*\*\* -- a CGI script -- a response -- the price -- \*\*\*\*\* -- it is good.

[0425] As mentioned above, although the 4th operation gestalt has described remote control of the AV equipment according to the AV/C command on an IEEE1394 bus, same control can be similarly performed about the device which has a protocol group depending on the link layer of other arbitration. The case where LON which is a kind of a home automation network is applied as the example is explained.

[0426] Drawing 48 and drawing 49 show the example of an internal configuration of AV contact which connects LON, respectively, and the example of a configuration of a HTTP/RTSP processing facility.

[0427] the point which can send out now command groups, such as the command group defined by LON, for example, LONTalk etc., instead of the AV/C command of IEEE1394 -- difference -- it is a point and each other configuration sections are the same as that of the above-mentioned.

[0428] In addition, each function explained with the 4th operation gestalt above is realizable also as software. Moreover, it can also carry out as a medium which recorded the program for making a computer perform each above-mentioned procedure or the above-mentioned means and in which machine read is possible.

[0429] This invention is not limited to the gestalt of operation mentioned above, in the technical range, can deform variously and can be carried out.

[0430] (5th operation gestalt) Drawing 51 is what showed the example of a configuration of the communication system concerning the 5th operation gestalt of this invention, and the 1st network (for example, home network which consists of IEEE1394 buses) 2010 and 2nd network (for example, Internet on a public network 2101) interconnect through the AV contact 2201. Hereafter, the 1st network 2010 is called a home network 2010, and the 2nd network 2101 is called the Internet 2101. Moreover, each terminal unit connected to the home network 2010 presupposes that it is an information appliance with the Internet processing facility.

[0431] The AV contact 2201 has the role of the Gateway which connects a home network 2010 and the Internet 2101, and it has the termination function of a home network or the Internet, router ability, a protocol conversion function, deputy server ability, etc. so that it may mention later.

[0432] The personal computer (PC) 2001, the printer 2002, and the DVD player 2003 are connected to the IEEE1394 bus which constitutes a home network 2010. The IP terminal 2102 which can perform IP communication link is connected to the Internet 2101. Of course, terminal units other than the above may be connected to a home network 2010 and the Internet 2101.

[0433] In drawing 51, all terminal units are terminal units which can have an Internet terminal, i.e., an IP address, and can perform IP communication link. However, the IEEE1394 bus which constitutes a home network 2010 is employed in the address of private IP address space, and the Internet 2102 is employed in global IP address (for example, IPv4) space. The IP address of the IP terminal 2101 presupposes that it is "G. 2." On the other hand, as the address of each equipment on a home network 2010, it has the private subnet address "P. 0", and PC2001 presupposes that "P. 1" and a printer 2002 are [ "P. 2" and the DVD player 2003 ] "P. 3."

[0434] Since it connects with these [ from which an address system differs ] two networks, the AV contact 2201 has the address of two different address systems. That is, the IP address by the side of a home network 2010 presupposes that the IP address by the side of the Internet 2101 is "G. 1" by "P. 254."

[0435] Drawing 52 shows the example of a configuration of the AV contact 2201. The AV contact 2201 A home network 2010 The Internet interface 2205 which manages the interface for accessing 1394 interfaces (I/F) 2202 and the Internet 2101 which manage the interface for connecting with the IEEE1394 bus to constitute (I/F), The service in IP processing section 2202 which performs routing processing of the Internet packet, address translation between a global IP address and a private IP address, etc., and a home network 2010 is detected. The equipment on the service location deputy processing section 2203 which collects and presents these services through the homepage processing section 2204 to the Internet 2101 side (advertisement), and a home network 2010, About service, the homepage which can perform remote control from the Internet 2101 side is generated, and it consists of the homepage processing sections 2204 which deliver this according to a demand.

[0436] IP processing section 2202 possesses the NAT processing section 2206 which performs address translation processing. NAT is the abbreviation for network address translation (translation), and, generally transform processing between a global IP address and a private IP address or transform processing of the IPv4 address and the IPv6 address is performed. For details, please refer to RFC1631.

[0437] The NAT processing section 2206 also has the address translation function of the port unit called an IP masquerade. Namely, even if many terminal units are in a home network 2010 side It is the technique which will be made enough if there is one global IP address (G. "1" when it is this operation gestalt) required for the Internet 2101 side. Specifically Each terminal unit connected to the home network 2101, As opposed to the logic multiplex identifier (the logic multiplex identifier of the service identified in the port number specified by RFC1340 is a port number) of each service (for example, service identified in the port number specified by RFC1340) Other separate logic multiplex identifiers (for example, port number specified by RFC1340) are assigned for every service with the same global IP address "G. 1." It memorizes as a table (address port

number translation table 2207) as shows these response relation to drawing 55 . And the communication link of the terminal unit on the Internet 2101 and the equipment on a home network 2010 is mutually attained by changing into the address and the port number of a mutual address space the destination address of the packet transmitted to another side from either the Internet 2101 and the home network 2010 using this table 2207, and being transmitted.

[0438] IP processing section 2202 possesses a packet filter 2208 further. A packet filter 2208 has a function as the so-called firewall. That is, as the packet (or packet which may pass) which should pass the AV contact 2201 and which does not come out is distinguished and this is not passed to other parts other than IP processing section 2202 about the packet which should pass and which does not come out (for example, it discards), access to a home network 2010 from the outside is restricted. This prevents beforehand access to the service on the home network 2010 by the malicious user. For this decision processing, a packet filter 2208 has the table (packet filter table 2209) which passed the AV contact 2201 and registered the source address of the packet which can be sent out to a home network 2010, and when the source address of the packet inputted from the Internet 2101 is registered into this table, it permits that passage. In addition, the source address which does not pass the AV contact 2201 may be registered into the packet filter table 2209. In this case, if the source address of the packet inputted from the Internet 2101 is not registered into this table, it permits passage of that packet.

[0439] Next, the case where access a home network 2010, for example, the DVD player 2003 is operated by remote control from the IP terminal 2102 on the Internet 2101 with reference to the sequence shown in drawing 53 is taken for an example, and processing actuation of the AV contact 2201 is explained.

[0440] First, the service location deputy processing section 2203 of the AV contact 2201 collects the service location information on a home network 2010 (step S5001 – step S5003). Service location information is information which shows what kind of service or terminal unit exists on a home network 2010. Some approaches can be considered as an approach of collecting service location information. For example, although various approaches, such as an approach using a service location protocol, an approach using LDAP (lightweight directory access protocol), an approach using DHCP (dynamic host configuration protocol), and an approach using MIB (management information base) of SNMP (simple network-control protocol), can be considered, which these approaches may be used.

[0441] Here, the service location information on a home network 2010 shall be collected, for example using a service location protocol as shown in drawing 12 . In addition, refer to RFC2165 for the detail of a service location protocol. Like drawing 53 , the AV contact 2201 serves as a directory agent of a home network 2010, and collection of actual service location information may register each service to the AV contact 2201 from each service agent (namely, PC2001, a printer 2002, the DVD player 2003).

[0442] In addition, the AV contact 2201 sends out a service request to IP multicast address beforehand assigned to each service about the service which can support the AV contact 2201 besides such an approach, and you may make it the terminal unit itself which offers the service concerned answer to this demand. Moreover, you may make it ask the directory agent the AV contact 2201 recognizes [ an agent ] separate existence on a home network 2010 the detail of service on a home network 2010.

[0443] Based on the information (port number of the service specifically offered by the address and the equipment concerned of a terminal unit on a home network 2010 (RFC1340 prescribes)) about the service currently offered on the home network 2010 collected here, processing actuation as shown in the flow chart of drawing 54 is performed.

[0444] The AV contact 2201 creates the homepage explaining what kind of service and terminal unit exist in owner (for example, referred to as Mr. A) \*\* of a home network 2010 in the homepage processing section 2204 (step S5101 – step S5102).

[0445] This homepage is a homepage displayed to access URL (Uniform Resource Locator), "http://G.1", of A Mr. \*\* from the terminal unit of the arbitration on the Internet 2101 as shows drawing 59 . [ i.e., ] It is the user interface which can operate each service which exists in A Mr. \*\*, and a terminal unit by the CGI (Common Gate Way) program from this homepage, for example. If the link is stretched to each terminal unit on a home network 2010 and that object is actually clicked from this homepage, next it connects with the homepage of each terminal unit, and has become the structure as which the homepage which becomes possible [ operating the actuation switch of that terminal unit which each terminal unit offers by remote control ] is displayed.

[0446] Next, the service location deputy processing section 2203 assigns the port number (well not a NOUN port number but the port number which can be set up dynamically) specified by the original logic multiplex identifier 1340, i.e., RFC, about each of the service collected previously or a terminal unit (step S5104). It sets from the first on a home network 2010, and a \*\*\*\*\* port number calls the port number to which it sets from the first on a home network 2010 and to which a \*\*\*\*\* port number is hereafter assigned uniquely



in the service location deputy processing section 2203 to the service on the 1st port number, a call, and a home network 2010 the 2nd port number, in order to distinguish.

[0447] For example, the 2nd port number "2000" is assigned so that the 2nd port number "2002" may tell it a printer 2002 and the 2nd port number "2004" may tell PC2001 to the DVD player 2003. This 2nd port number becomes the global IP address and group of the AV contact 2201, and is employed. That is, from the Internet 2101 side, when the 2nd port number "2000" is accessed, this will interpret the AV contact 2201 as it being access to the DVD player 2003. In addition, if a logic multiplex identifier is an identifier which can identify on the Internet each service offered not only the port number specified by RFC1340 but on a home network 2010, it is good anything.

[0448] The response relation between the global unique IP address of the AV contact 2201, the 2nd port number assigned to each service offered on a home network 2010, the 1st port number as a logic multiplex identifier to the service concerned on a home network 2010, and the private IP address of equipment which offers the service concerned is registered into the table 2207 corresponding to an address port number (step S5105).

[0449] The example of the table 2207 corresponding to an address port number is shown in drawing 55. The IP address by the side of the Internet 2101 (global unique IP address), the IP address by the side of the 2nd port number and a home network 2010 (private IP address), and the pair of the 1st port number are registered into the table 2207 corresponding to an address port number for each [ are provided on a home network 2010 ] the service of every. Sequential registration of the response relation about all services with which this table 2207 is provided on a home network 2010 is carried out.

[0450] For example, in the case of the DVD player 2003, to the Internet 2101 side, the 2nd port number "2000" is assigned to service (IP address (private IP address) = P.3, the 1st port number = interpreted as it being the http service offered by the DVD player by 80 by the service location protocol) of the DVD player within a home network 2010 by the global IP address "G. 1" of the AV contact 2201.

[0451] Creation of such an address port number translation table 2207 is performed about each of service of A Mr. \*\*. About this each, description to the homepage of A Mr. \*\* is performed.

[0452] About all services of A Mr. \*\*, after the registration to a table 2207 finishes, creation of the address port number translation table 2207 and creation of the homepage of A Mr. \*\* are completed (step S5106).

[0453] Now, the created address port number translation table 2207 is used in case an IP packet passes through the inside of the AV contact 2201, and an IP address and transform processing of a port number are performed. With reference to drawing 58, transform processing of the IP address and port number using the address port number translation table 2207 is explained concretely. For example, by referring to a table 2207, an IP packet [ as / the Internet 2101 side to whose destination IP address is "G. 1" / whose destination port number is "2000" ] is changed into an IP packet [ as / whose destination IP address is "P. 3" / whose destination port number is "80" ], and is sent out to a home network 2010 side. On the contrary, a transmitting agency IP address is changed into an IP packet [ as / "G. 1" and whose transmitting agency port number are "2000" ], and, as for an IP packet [ as / "P. 3" and whose transmitting agency port number are "80" ], a home network 110 side to a transmitting agency IP address is sent out to the Internet 2101.

[0454] Now, such an address port number translation table 2207 and the AV contact 2201 which ended creation of the homepage of A Mr. \*\* exhibit this homepage on the Internet 2101 as a homepage of A Mr. \*\* (refer to drawing 59 ).

[0455] Next, the user of the IP terminal 2102 on the Internet 2101 explains the case where the DVD player 2003 of A Mr. \*\* is operated by remote control.

[0456] Processing actuation of the AV contact 2201 at the time of receiving an IP packet for processing actuation of the AV contact 2210 at the time of receiving an IP packet from the Internet 2101 side from a home network 2010 side to drawing 56 is shown in drawing 57. Hereafter, it explains with reference to the flow chart shown in drawing 53, drawing 56 - drawing 57.

[0457] First, the IP terminal 2102 performs authentication procedure in order to require sending of the homepage of A Mr. \*\* from the AV contact 2201 (step S5004 of drawing 53 ). For example, to the user of the IP terminal 2102, a password input etc. is required and the IP address of the IP terminal 2102 is registered into the above-mentioned packet filter table 2209 only about the user attested by this.

[0458] Access only of the IP address which the packet filter table 2209 is a table of only having only enumerated IP addresses, and is registered into this table to the service offered on a home network 2010 and a home network 2010 is attained.

[0459] Next, the IP terminal 2102 requires sending of the homepage of A Mr. \*\* from the AV contact 104 (step S5005). It checks (step S5006), when the source address concerned is registered into the packet filter table 2209, it restricts whether the source address of the packet of a sending demand of the homepage concerned is



registered into the packet filter table 2209 by the packet filter 2208, and the packet concerned is passed to the homepage processing section 2204, and the homepage processing section 2204 sends the homepage of A Mr. \*\* to the IP terminal 2102 according to the demand concerned (step S5007).

[0460] As shown in drawing 59 R> 9, the link to each homepage of the DVD player 2003 on a home network 2010, a printer 2002, and PC2001 is attached to the homepage sent here. For example, it is linked to the alphabetic character or picture on the homepage of drawing 59 a "DVD player" to the DVD player 2003. The address of a actual link place serves as the 2nd port number "2000" of the global IP address "G. 1" of the AV contact 2201, and the format top serves as a deputy server for the AV contact 2201 to access to the equipment on a home network 2010. Of course, this is not recognized from the IP terminal 2102. However, the processing which the AV contact 2201 performs actually unlike deputy server processing is IP masquerade processing, i.e., an IP address and transform processing of a port number, like the after-mentioned.

[0461] Now, the user of the IP terminal 2102 sends out the sending-out demand of the homepage of a DVD player so that he may operate the DVD player 2003 by remote control. For example, the IP packet of a sending-out demand of the homepage of a DVD player is sent out by clicking the alphabetic character or picture on the homepage shown in drawing 59 a "DVD player." A destination IP address is [ "G. 1" and the destination port number of the destination of this packet ] "2000" (step S5008).

[0462] This IP packet is explained with reference to the flow chart shown in drawing 56 about packet filtering and address port number transform processing to the processing actuation S5009, i.e., the step of drawing 53 , when the AV contact 2201 receives - step S5010.

[0463] The AV contact 2201 will perform packet-filtering processing with reference to the packet filter table 2209 first, if it checks that it is addressing to itself with reference to the destination address of the IP packet which received (step S5201) (step S5202). If the source address of the packet concerned is registered into the packet filter table 2209 next, it will be confirmed whether the group of the destination IP address of the packet concerned and a destination port number is registered into the address port number translation table 2207 (step S5203). If registered, according to the address port number translation table 2207, the destination IP address concerned and a destination port number are substituted for the IP address (private IP address) and the 1st port number by the side of a corresponding home network (step S5204), and the IP packet concerned is sent out to a home network 2010 (step S5205). Thus, address translation from a global IP address and the 2nd port number to a private address and the 1st port number is performed.

[0464] In addition, it does not register with the address port number translation table 2207, and the packet is discarded when it is not a packet addressed to AV contact 2201 itself (step S5206).

[0465] The IP packet which return and address port number transform processing (IP masquerade processing) were performed to explanation of drawing 53 , and was sent out to the home network 2010 side reaches the DVD player 2003 (step S5011), and the DVD player 2003 sends the homepage of the DVD player 2003 by making the global IP address of the IP terminal 2102 into a destination address. A private IP address "P. 3" and the transmitting agency port number of the transmitting agency IP address of the IP packet in that case are the 1st port number "80" (step S5012).

[0466] The IP packet containing the homepage of the DVD player 2003 is explained about processing actuation of the AV contact 2201 when receiving from a home network 2010 side, i.e., address port number transform-processing actuation of step S5013 of drawing 53 , with reference to the flow chart shown in drawing 57 .

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[Translation done.]

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to the communications control approach performed by a communication device and these communication devices, such as a computer which may control communication devices, such as a computer equipped with the function which controls remote operation of the directory service in a home network environment, and a device, or a peripheral device, especially the various equipments connected to the general-purpose bus, the service registration approach, the service provision approach, and the device control program registration approach.

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[Translation done.]

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PRIOR ART

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[Description of the Prior Art] (1) Digitization of electronic equipment is advancing quickly so that development of a multimedia technique may be symbolic in recent years. This inclination has started in office environment first. In the field of hardware, it is going on in the form of installation of a personal computer, digitizations of OA equipment, and those networks. In the field of software, the Internet applications, such as software, such as basic business (rightsizing of this is carried out and it is shifting to a personal computer etc.) by the host, and a word processor, a spreadsheet, or WWW, etc. are introduced. And Field of application of digitization is circulated increasingly and the development does not know the place which remains.

[0003] The above-mentioned inclination is seen also in the device used by domestic, its related field, etc. That is, digitizations, such as installation of Internet accesses, such as digitizations (namely, DVD, digital VTR, a digital camcorder, etc.) of an AV equipment, digitization of broadcast, and OCN, etc., are advancing steadily.

[0004] The wave of the promoted above technological innovation including office environment can consider going towards a network from now on. That is, the technique of various fields, such as information, a communication link, and broadcast, is bundled by digitization, and it is said that exchange is begun by network.

[0005] As a network technique used as the base for realizing this, it thinks of various candidates. For example, Ethernet has an overwhelming track record in office environment, and it can be said also in the personal computer network in a home that he is the leading candidate. Moreover, ATM is also a strong candidate. This is because it is a general motion that the construction sides (telephone company, CATV, etc.) of an infrastructure will build an infrastructure using this technique paying attention to the description of ATM, such as a high speed, real time, and a broadband.

[0006] these candidates -- in addition, recently -- IEEE1394 -- a network technique

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[Translation done.]

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EFFECT OF THE INVENTION

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[Effect of the Invention] According to this invention, it is not dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0476] Moreover, according to this invention, it is not dependent on OS or hardware, and when the need arises, it becomes possible to register a device control program.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] Even if it is going to control conventionally the device which interconnected in domestic or the digital networks between homes, and minded the network (1) There is no technique for getting to know the information about the service currently offered on the location of each device which exists on a network, or the network. A user Existence of specific device/service has not been recognized on a network, and actuation or control of an object device was not able to be performed, or offer of service was not able to be received. Moreover, when the part according to a different protocol in interconnect of digital networks was intermingled, the user was not able to perform the actuation or control of an object device beyond a different protocol by there being no technique which tells an actuation command etc. exceeding a different protocol, or offer of service was not able to be received.

[0027] (2) Although it is thought that the so-called information appliance which had the various Internet processing facilities also in domestic will enter in the still nearer future, it worries about the current Internet at the serious lack of the address. It is unreal it to be thought for that the household-electric-appliances device which enters into domestic becomes very many numbers, and to newly consider an IP address to these [ all ]. Then, the two following approaches are proposed.

[0028] – Domestic uses a private IP address.

[0029] – The IPv6 (IP version 6) address is used for domestic.

[0030] However, as for the actual Internet (public network), it is actual to be applied by IPv4 (IP version 4), and when the above approaches are taken, it does not have the approach of accessing from the Internet to a domestic device. Although the user on the Internet (public network) needs to recognize the address of domestic various devices before actually performing those actuation even if it uses these as a solution for this problem, although NAT (network address translation) and an IP masquerade are known, there is no mechanism which realizes this.

[0031] (3) Moreover, conventionally, since the device driver was dependent on OS and did not have versatility, it had a trouble [ need / respectively / for every various OS's / the driver of correspondence / to be developed ]. Moreover, although building a device driver in abundance beforehand when a peripheral device is diversified was performed well, there was a trouble that the resource of OS will be vainly occupied by the device driver of the equipment which is not used and API corresponding to a higher-level protocol.

[0032] It is not dependent on a specific network and this invention aims at offering the communication device which can realize a unific service provision environment, the service registration approach, and the service provision approach, in order to have been made in consideration of the above-mentioned situation and to solve the 1st trouble of the above.

[0033] Moreover, in order to solve the 2nd trouble of the above, this invention aims at offering the communication device which makes accessible service currently offered in each network even from other networks, even when the networks (for example, IPv4, IPv6 and a private address, IPv4 and a

private address, IPv6, etc.) where address systems differ are interconnected.

[0034] Moreover, in order to solve the 3rd trouble of the above, it is not dependent on OS or hardware, and this invention aims at offering the possible communication device of registering a device control program, and the device control program registration approach, when the need arises.

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[Translation done.]

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**MEANS**

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[Means for Solving the Problem] (1) This inventions (claim 1) are the communication devices (for example, personal computer etc.) equipped with the means of communications which operates the register by which the map was carried out to single-address space, and a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment, and are characterized by describing dynamically the information about the service which works on self-equipment (the communication device concerned) for said configuration information storage means.

[0036] According to this invention, it communicates through a communication device, and also by accessing this configuration information storage means, a node can recognize timely the application which that communication device has served at that time, the directory service of a network configuration and the service detection of a migration node of it are attained, and its flexibility of employment of a network improves. Especially the effectiveness of changing service configuration information dynamically, since dynamic change of operation of the service will become more intense with [ the case where operation service changes dynamically, and when service is realized by software ] install of software, version up, etc. will become very big.

[0037] The means of communications which operates the register with which the map of this invention (claim 2) was carried out to single-address space, The communication device equipped with a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment (It is [ for example, ] a personal computer etc.) and is characterized by describing collectively the information about the service which works on self-equipment (the communication device concerned), and the information (for example, Vendor ID, a node capability, etc.) about the attribute of self-equipment for said configuration information storage means.

[0038] In case according to this invention it communicates through a communication device, and also both the configuration information which used service as the base, and the configuration information which used equipment as the base can be notified to a node and these other nodes constitute the directory information of the network where the communication device is connected, it is effective in simplifying more selection of whether it considers as the configuration information according to service, or to consider as the configuration information according to equipment. Since both the user who has got used to the actuation and retrieval according to service, and the user who has got used to the actuation and retrieval according to equipment exist and it corresponds to the both, this is especially useful.

[0039] The 1st means of communications which operates the register with which the map of this invention (claim 3) was carried out to single-address space, The communication device equipped with a configuration information storage means (configuration memory) to memorize the configuration information about self-equipment (For example, it is a personal computer etc.) for said configuration information storage means It is characterized by describing a part of



configuration information [ at least ] (for example, information on a terminal, information on service) about the network connected to self-equipment (the communication device concerned) through the 2nd different means of communications from said 1st means of communications.

[0040] According to this invention, nodes other than the communication device concerned connected to the 1st means of communications. The network configuration information connected to the communication device concerned at the 2nd means of communications. It becomes possible to recognize through this configuration information storage means. This result, It becomes possible to recognize the configuration information of the whole network which interconnected through the configuration information storage means through the 1st means of communications, and, therefore, it becomes possible to attain simplification of structure, such as a network control and network service registration, and time and effort.

[0041] This inventions (claim 4) are communication devices (for example, personal computer etc.) which register service into the directory agent who exists in the connected network, and are characterized by having a means to register the service of electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) which communicates with the protocol depending on the data link of said connected network into said directory agent instead of this electronic device.

[0042] According to this invention, a directory agent As opposed to the directory service of the protocols (for example, network layer protocols, such as IP etc.) with which it works It becomes possible to register the services (for example, AV/C protocol of IEEE1394 etc.) offered with data link layer protocols (for example, IEEE1394 layer etc.). Consequently, a directory agent or a directory service becomes that offer layer is fair and possible [ being searched ] about the service developed on the network, and becomes possible [ aiming at improvement in a network user's convenience, and improvement in flexibility to coincidence ].

[0043] This inventions (claim 5) are communication devices (for example, personal computer etc.) which notify the information about service according to the inquiry from the user agent in the connected network, and are characterized by to have a means to notify said user agent of the service of electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) which communicates with the protocol depending on the data link of said connected network instead of this electronic device.

[0044] As opposed to service location service of the protocols (for example, network layer protocols, such as IP etc.) with which, as for a user agent, it works according to this invention It becomes possible to acquire the information about the service offered with data link layer protocols (for example, IEEE1394 layer etc.). Consequently, a user agent or service location service becomes possible [ that offer layer being fair and searching the service developed on the network ], and can aim at improvement in a network user's convenience, and improvement in flexibility to coincidence.

[0045] This invention (claim 6) is set to a communication device according to claim 4 or 5, and is characterized by registering or notifying the logic multiplex identifier of self-equipments (for example, personal computer etc.) as a port for access to said service registered or notified in the case of a notice to the registration to a directory agent, or a user agent.

[0046] If it does in this way, said communication device will become possible [ recognizing that it is access to service of said electronic device when there is access to the logic multiplex identifier ], and it becomes possible to perform suitable processing for actually realizing the service.

[0047] On the other hand, a directory agent becomes possible [ offering the unific directory service which becomes possible / answering /, has this logic multiplex identifier as an access point to service of said electronic device, and does not ask the offer layer of service ].

[0048] Moreover, when this logic multiplex identifier is notified as an access point to service of said electronic device, he does not ask a layer, but a user agent will recognize it as what is provided with that service through this logic multiplex identifier, and it is the whole network and he becomes

possible [ offering the unific service provision organization which does not ask a layer ].

[0049] In a communication device according to claim 6, this invention (claim 7) is characterized by changing into the command of the protocol which depends for this command on said data link corresponding to it, and transmitting to said electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.), when a command arrives at the port specified by said logic multiplex identifier.

[0050] When doing in this way and said communication device has access to the logic multiplex identifier After carrying out command conversion corresponding to the protocol of the offer data link to the stereo which recognizes that it is access to service of said electronic device, and actually offers the service It becomes possible to perform the command sending out, i.e., to perform a service request, and it has and it becomes possible to aim at implementation of the procedure of the whole "service request -> service implementation."

[0051] Moreover, since the user agent will recognize access to service of said electronic device to be what is performed to the last by the layer which described the command, if even the environment of a service access, the simplification, i.e., this layer, of processing, is prepared, he will mean that access to the various services on this network is attained, and will become possible [ contributing to each of the simplification of the service provision environment of this network, increase in efficiency, and unification-izing ].

[0052] This invention (claim 8) is characterized by having a correspondence table for mapping to the command of the protocol which depends on said data link corresponding to this command for the command which arrived at the port of said logic multiplex identifier in a communication device according to claim 6.

[0053] If it does in this way, said communication device will become possible [ performing command conversion when there is access to the logic multiplex identifier in the procedure for which it was able to opt beforehand ]. By this After carrying out command conversion corresponding to the protocol of the offer data link to the stereo which recognizes that it is access to service of said electronic device, and actually offers the service It becomes possible to perform the command sending out, i.e., to perform a service request, and it has and it becomes possible to aim at implementation of the procedure of the whole "service request -> service implementation."

[0054] Moreover, since the user agent will recognize access to service of said electronic device to be what is performed to the last by the layer which described the command, if even the environment of a service access, the simplification, i.e., this layer, of processing, is prepared, he will mean that access to the various services on this network is attained, and will become possible [ contributing to each of the simplification of the service provision environment of this network, increase in efficiency, and unification-izing ].

[0055] If this invention (claim 9) cannot communicate if the 1st means of communications is followed, but the 2nd means of communications is followed, the electronic device which can communicate, It is the service registration approach in the communication device connected to the network where the electronic device which can communicate may be connected even if it follows any of the 1st means of communications and the 2nd means of communications. With the electronic device with which registration of the information about the service offered from said each of electronic device through said 1st means of communications was received, and existence has been recognized by said 2nd means of communications and said 1st means of communications about a thing without said notice which leads The information about the service offered by this each of electronic device that should be registered is acquired using said 2nd means of communications. Based on the information about said notified service, and the information about said acquired service, it is characterized by constituting the service directory information on said network.

[0056] It is the service provision approach in the communication device to which at least one electronic device which can communicate was connected when this invention (claim 10) could not

communicate when following the 1st protocol, but following the 2nd protocol. The logic multiplex identifier of self-equipment which follows said 1st protocol as a port for access to the service offered by said electronic device is assigned. When a command arrives at the port specified by said logic multiplex identifier, it is characterized by changing this command into the command according to said 2nd protocol, and transmitting to said electronic device.

[0057] (2) The means of communications which operates the register with which the map of this invention (claim 11) was carried out to single-address space, An acquisition means by which the attribute information (for example, unique ID, unit ID, capability, etc.) on the electronic devices (for example, a peripheral device, an AV equipment, a household-electric-appliances device, etc.) recognized by said means of communications comes to hand, Registration (inclusion to OS) of the device control program (device driver software) which controls said electronic device by publishing the directions which operate the register on said single-address space to said means of communications It is characterized by having the registration means performed working based on the attribute information on said electronic device which came to hand.

[0058] According to this invention, said device control program will play the so-called role of a device driver, but According to this invention, it is based on the attribute information on the electronic device received by the means of communications which operates the register by which the map was carried out to single-address space. Since the device control program which controls said electronic device by publishing the directions which operate the register on said single-address space is registered, the device control program united with the attribute of the object driven if needed during actuation is incorporable into OS.

[0059] moreover, a device control program -- a network loader -- if provided in a bull form (for example, form described in JAVA language), it will become possible to register a device control program, without asking the classification of OS, and the classification of hardware.

[0060] This invention (claim 12) is characterized by said registration means having a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand with said acquisition means, and a means by which the corresponding device control program comes to hand based on said identifier searched for in a communication device according to claim 11.

[0061] If it does in this way, the device control program which suited the attribute of said electronic device can come to hand if needed, and can be used as a device driver.

[0062] In a communication device according to claim 11 or 12, the attribute information on said electronic device is described by the configuration information storage region (for example, Configuration ROM or configuration memory) where it was beforehand set in said electronic device, and this invention (claim 13) is characterized by said attribute information coming to hand by reading the contents said acquisition means was described to be by said configuration information storage region.

[0063] Thus, if it is made for the attribute information on said electronic device to come to hand by reading the configuration information storage region in the electronic device concerned, it is expected that the attribute information on the device will usually be described by the configuration information storage region, and it is expected that the suitable information used as the key of a coming-to-hand [ a suitable device control program ] sake will be acquired.

[0064] This invention (claim 14) is characterized by offering said single-address space in the form of an IEEE1394 bus in a communication device given in claim 11 thru/or any 1 term of 13.

[0065] Since an IEEE1394 bus can be interpreted as a bus which realizes single room, it is possible to adopt the above-mentioned device as it is, dynamic loading through the network of the device driver of the network which was originally difficult becomes possible, and it can raise a user's convenience by leaps and bounds.

[0066] This invention (claim 15) is characterized by setting to a communication device given in claim 12 thru/or any 1 term of 14, and using the identifier which can direct the specific resource of

an external network as an identifier of said device control program.

[0067] Thus, it becomes possible for the device control program of said electronic device to come to hand from an external network a network loader, then if needed, and said communication device is wide opened from the constraint that it must have all the device control programs assumed beforehand, and becomes possible [ enjoying various advantages, such as saving of the capacity of a disk or OS, and version up of software, ].

[0068] A device control program is preferably described in JAVA language etc.

[0069] The communication link between a predetermined electronic device and other communication devices (the 2nd communication device) which can be communicated this invention (claim 16) with a means to operate the register by which the map was carried out to single-address space. It is a possible communication device (the 1st communication device) by the means of communications using a logic network. said means of communications -- leading -- said -- others -- a communication device (the 2nd communication device) -- receiving -- said -- an electronic device. A means to require acquisition of (attributes [ for example, ], such as personal computer, peripheral-device, AV equipment, and household-electric-appliances device) information (for example, unique ID, unit ID, capability, etc.). A means to perform registration (inclusion to OS) of the device control program (device driver software) which controls said electronic device working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand. It is characterized by having a means to transmit and receive the information about the directions which operate the register on said single-address space through said means of communications between communication devices (the 2nd communication device) besides the above.

[0070] According to this invention, the communication device (the 1st communication device) which is a control subject. It can have a function for using said electronic device by considering as agency other communication devices (the 2nd communication device) connected through the logic network. It becomes possible to control a remote electronic device not only through a means to operate the register by which the map was carried out on single-address space but through a logic network, without changing the control program which operates the register on single-address space.

[0071] You may make it the means preferably performed working based on the attribute information on said electronic device which came to hand from the communication device besides the above by said demand have a means to search for the identifier of the device control program which should come to hand based on the attribute information on said electronic device which came to hand, and a means by which the corresponding device control program comes to hand based on said identifier searched for.

[0072] Moreover, preferably, the attribute information on said electronic device may be described by the configuration information storage region where it was beforehand set in said electronic device, and said attribute information may come to hand by reading the contents described by said configuration information storage region with the communication device (the 2nd communication device) besides the above.

[0073] Moreover, said single-address space may be preferably offered in the form of an IEEE1394 bus.

[0074] Moreover, the identifier which can direct the specific resource of an external network as an identifier of said device control program preferably may be used.

[0075] This invention (claim 17) is the device control program registration approach of registering a device control program working [ a communication device ]. The attribute information on the electronic device recognized by the predetermined means of communications which operates the register by which the map was carried out to single-address space comes to hand. It is characterized by performing registration of the device control program which controls said electronic device working based on the attribute information on said electronic device which came

to hand by publishing the directions which operate the register on said single-address space to said means of communications.

[0076] In addition, invention concerning each equipment [ more than ] is materialized also as invention concerning an approach.

[0077] Moreover, the above-mentioned invention is materialized also as a medium which recorded the program for making a computer perform a procedure, a corresponding function, or a corresponding means and in which machine read is possible.

[0078] (3) In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 18) of this invention to the 1st network, and it depends on this 1st network through the 2nd network Said 2nd network is minded for the information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment at least. An offer means to provide, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, By having changed into said 1st command the 2nd command contained in the message received with this receiving means, and having provided the control means which controls said service provision equipment by this 1st command It is not dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0079] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 19) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, The information about the 2nd command depending on the communications protocol of said 2nd network corresponding to the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means An offer means to provide through said 2nd network at least, and a receiving means to receive the message containing the 2nd command offered with this offer means through said 2nd network, By having changed into said 1st command the 2nd command contained in the message received with this receiving means, and having provided the control means which controls said service provision equipment by this 1st command It is not dependent on a specific network and it becomes possible to realize a unific service provision environment.

[0080] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 22) of this invention to the 1st network, and it depends on this 1st network through the 2nd network An offer means to offer the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0081] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 23) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, An offer means to offer the homepage for publishing the 1st command depending

on the communications protocol of said 1st network for controlling said service provision equipment corresponding to the information about the service collected with this collection means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0082] In the communication device for controlling the service provision equipment which communicates with the protocol for which connects the communication device (claim 24) of this invention to the 1st network, and it depends on this 1st network through the 2nd network A collection means to collect the information about the service which said service provision equipment offers, A creation means to create the homepage for publishing the 1st command depending on the communications protocol of said 1st network for controlling said service provision equipment based on the information about the service collected with this collection means, An offer means to offer the homepage created with this creation means through said 2nd network, A receiving means to receive the message based on said homepage offered with this offer means through said 2nd network, By having provided the control means which controls said service provision equipment by said 1st command published based on the message received with this receiving means Like the AV equipment which the user who operates it by receiving a homepage does not ask what the protocol of the service provision equipment connected to the 1st network is, but is specifically connected to IEEE1394 It becomes possible also about the device which interprets only the protocol depending on a link layer technique to perform remote control.

[0083] In addition, the communication device (claim 25) of this invention The table which registered the 2nd command depending on the communications protocol of said 2nd network for controlling this service provision equipment corresponding to said 1st command which said service provision equipment offers, and which was beforehand defined for every service is provided. By acquiring the information about the 2nd command corresponding to the information about the service collected with said collection means from this table, and creating said homepage, to a homepage It becomes possible to display the list of remote control of service provision equipment realizable using the 2nd command information (remote-control command), and it becomes possible to create the homepage which had and enumerated the remote-control approaches which can be employed.

[0084] The communication device (claim 26) of this invention moreover, said message The 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment is included. Said control means By changing into said 1st command the 2nd command contained in the message received with said receiving means with reference to the correspondence table of said 1st command and said 2nd command When the 2nd specific command information (remote-control command) is received through said receiving means If the table corresponding to the above is referred to, it comes to be turned out what kind of actuation it should just perform to the equipment (service provision equipment connected to the 1st network in this case) of a request of the 1st network.

[0085] The communication device (claim 27) of this invention moreover, said message The 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment, The address depending on the communications protocol of said 2nd network and the multiplex identifier for specifying said service provision equipment depending on said 1st network are included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the correspondence table of said 1st command and said 2nd command. The node which received the

homepage by controlling the service provision equipment identified in said multiplex identifier by this 1st command By working on the object by which hyperlink reference was carried out as 2nd command information (remote-control command) It becomes possible to operate the service provision equipment which became possible [ specifying the service provision equipment connected to said 1st network which is a controlled system, and specifying actuation of the request ], had and was connected to said 1st desired network by remote control.

[0086] The communication device (claim 28) of this invention moreover, said homepage The program for generating the message containing the 2nd command depending on the communications protocol of said 2nd network for controlling said service provision equipment is included. Said control means changes into said 1st command the 2nd command contained in the message received with said receiving means with reference to the correspondence table of said 1st command and said 2nd command. The node which received the homepage by controlling service provision equipment by this 1st command The program (JAVA program) matched with it is started. It becomes possible to operate the service provision equipment which it became possible for the command which specifies the service provision equipment connected to said 1st network which is a controlled system, and specifies actuation of the request to be made to publish, and had and was connected to said 1st desired network by remote control.

[0087] The communication device (claim 29) of this invention moreover, said control means By starting the program (for example, CGI script) for publishing said 1st command by the message received with said receiving means The node which received the homepage starts the program (CGI script) matched with it. the command which specifies the service provision equipment connected to said 1st network which is a controlled system, and specifies actuation of the request -- issue \*\*\*\*\* -- it becomes possible to operate the service provision equipment which what of became possible, and had and was connected to said 1st desired network by remote control.

[0088] Moreover, in case the communication device (claim 30) of this invention transmits information in response to the demand from the partner node which received said homepage by including the information which specifies the communications protocol at the time of transmitting information as said message, the sending-out approach can be specified now, and it can have it, and can send information into a transmitting partner certainly. This has him, especially when the partner who should transmit does not have the receiving capacity of a network layer packet. [ effective ] Moreover, when the node which receives transmit information is not supporting the same network layer protocol as the 2nd command information (remote-control command), or when great cost starts the capsulation to the network layer protocol of transmit information, it becomes possible to urge the equipment which received said homepage to the information transmission of those other than a network layer protocol.

[0089] Furthermore, the header information depending on this communications protocol at the time of transmitting the information other than information that the communications protocol at the time of transmitting information to said message is specified may be included.

[0090] The communication device (claim 35, 5th operation gestalt) of this invention It is the communication device connected to the 1st network and 2nd network. The 2nd logic multiplex identifier is assigned to the service offered by the 1st logic multiplex identifier of the equipment of the arbitration on said 1st network. The 1st [ said ] logic multiplex identifier and the 1st address of the equipment on the 1st [ said ] network which offers the service, A storage means to memorize the correspondence relation between the 2nd accessible address and said 2nd logic multiplex identifier from said 2nd network, A presentation means to show as service which can access each service of said 1st logic multiplex identifier by said 2nd address and said 2nd logic multiplex identifier from said 2nd network, By performing the packet transfer for offering the service on the 1st [ said ] network shown with said presentation means between said 1st and 2nd networks based on the correspondence relation memorized by said storage means The address system for which the 1st network differs from the 2nd network, For example, when the 2nd network is employed for



the address system of IPv4 [ the case where the 1st network is employed for the address system of IPv6, when the 1st network is employed for the system of a private IP address ] Access to the service currently offered in the 1st network is realizable to the user of the 2nd network.

[0091] That is, to the user of the 2nd network, the service currently offered in said 1st network shows to the 2nd network as what this communication device offers using the homepage as said presentation means. When there is access to this service from the user of said 2nd network The correspondence relation (address port number translation table) memorized by said storage means is used. By changing the user of said 2nd network, and the packet between these communication devices into the packet of the service compartment for which it is provided in this communication device and said 1st network It will be recognized as exchanging the transparent packet from the service currently offered in the user of said 2nd network, and said 1st network.

[0092] (Claim 36) By having provided further a collection means to collect the 1st addresses of the equipment which offers said 1st logic multiplex identifier and each service on said 1st network, it becomes possible to perform renewal of automatic as said presentation means (for example, a homepage) based on the collection information about service of said 1st network.

[0093] (Claim 37) The 2nd storage means which memorizes the identifier of the packet which can be transmitted to said 1st network among the packets inputted from said 2nd network, By having provided an output means to output only the packet which has the identifier memorized by said storage means among the packets inputted from said 2nd network to said 1st network User authentication can be performed beforehand and invasion of an inaccurate packet to said 1st network can be protected from external networks, such as a public network.

[0094]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of invention is explained, referring to a drawing.

[0095] (1st operation gestalt) The example of the structure of a system which starts this operation gestalt at drawing 1 is shown.

[0096] In this example, as shown in drawing 1, two domestic networks shall interconnect through a public network 2. A telephone network may be used and it may be [ whose public network 2 is ] like the circuit of wide bands, such as ISDN, or a dedicated line the Internet. However, the network with which it is satisfied of a communication band required for use and offer of service preferably is used.

[0097] The 1st domestic network consists of the 1st IEEE1394 bus 1. Moreover, the 1st AV contact 4, a personal computer (the following, PC) 6, and digital [ 7 ] one TV shall be connected to this IEEE1394 bus 1.

[0098] The 2nd domestic network consists of the 2nd IEEE1394 bus 3 and home automation network 12. With this operation gestalt, LON (local operating network) of an echelon company shall be used for this home automation network 12. LON of an echelon company is described in detail by obtaining-, for example from homepage (<http://www.echelon.com>) of echelon company etc. information.

[0099] The 2nd AV contact 5, the DVD player 8, digital VTR 9, PC10, and the printer 11 shall be connected to the IEEE1394 bus 3 of the 2nd domestic network. Moreover, PC10 is connected also to the home automation network 12. The home automation network 12 is connected also to an air-conditioner 13 and a microwave oven 14 besides PC10.

[0100] Among the terminal groups connected to these networks, the 1st AV contact 4, PC6, the 2nd AV contact 5, PC10, and the printer 11 have an IP address (here, it considers as a private IP address), respectively, and are the so-called IP terminal. For the IP address of 192.168.2.254 and PC6, the IP address of 192.168.2.1 and the 2nd AV contact 5 shall be [ the IP address of the 1st AV contact 4 / the IP address of 192.168.1.1 and a printer 11 of the IP address of 192.168.1.254 and PC10 ] 192.168.1.2. Thus, the private IP address or the global IP address shall be used for the IP address of the terminal in this operation gestalt (when a public network 2 is not the Internet but

ISDN etc.) (when a public network 2 is the Internet), and setup (setup of an IP routing table etc.) of the routing device for routing between each terminals shall be performed appropriately. In addition, although a current global IP address is 32 bits, it is likely to become 128 bits in the near future, and the environment which can assign a global IP address to each terminal is becoming actual.

[0101] On the other hand, digital [ 7 ] one TV, the DVD player 8, and digital VTR 9 are 1394 so-called terminals, and are terminals which interpret only 1394 protocol groups (IEEE1394 -1995, IEC1883, IEEE1394AV/C, SBP, etc.).

[0102] Moreover, an air-conditioner 13 and a microwave oven 14 are the so-called LON terminals, and are a terminal which interprets only the protocol group defined by LON.

[0103] The 1st AV contact 4 and the 2nd AV contact 5 have fundamentally the function which interconnects between two or more networks (they are an IEEE1394 bus and a public network in the case of this operation gestalt), respectively. The internal configuration of these AV contacts 4 and 5 is shown in drawing 2 .

[0104] As shown in drawing 2 , AV contact of this example has 1394 interfaces 21, the data link switch 22, the public network interface 23, the IP processing facility 24, the FANP processing facility 25, the 1394 / IP service location processing facility 26, the service location redundancy 27, the 1394AV command-processing function 28, and 1394 / IP command conversion function 29. Hardware may realize and software may realize each of these functions, respectively.

[0105] 1394 interfaces 21 are the functions used as an interface with 1394 buses.

[0106] The data link switch 22 is a switch for performing data transfer which straddles between networks. In more detail By reference (for example, reference of a synchronous channel identifier, ATM-VCI, transmission wavelength, etc., etc.) of only a data link layer identifier / information As the data transfer point is known beforehand clearly, it is a switch for transmitting the data which set up with protocols, such as FANP, and transmitted the data inputted from 1394 buses to the public network, and were inputted from the public network to 1394 buses.

[0107] The public network interface 23 is a function used as an interface with a public network. For example, if the data link layer of a public network is ATM, it will have the interface of ATM for the function of ATM signaling etc. logically physically.

[0108] The IP processing facilities 24 are many functions of a series of Internet Protocol (TCP/IP protocol suite), such as TCP/UDP/IP.

[0109] The FANP processing facility 25 is a function to perform the band in the data link layer of the transmission route of data, reservation of a virtual transmission-line identifier, and adjustment. In addition, the detail of a FANP processing facility is explained by reference "network interconnection method" in "REJIDENSHARU environment, the Institute of Electronics, Information and Communication Engineers, the information-network study group research report IN 97-19, and pp.73 1997 [ -78 or ]" (or Japanese Patent Application No. 8-264496, Japanese Patent Application No. 8-272672, Japanese Patent Application No. 9-52125) etc.

[0110] As for the FANP processing facility 25, it is desirable to prepare, in treating service with the need of guaranteeing a wide band to some extent like image data, and when it does not need a band guarantee, it may be excluded. In addition, it is also possible to use the processing facility which followed the RSVP protocol (Resource ReSerVation Protocol; draft-ietf-rsvp-spec-08.txt of the Internet draft) instead of the FANP processing facility.

[0111] Moreover, you may make it control use of FANP processing facility 25 grade according to the service to offer. For example, you may make it determine whether use FANP processing facility 25 grade for every group of an IP address and a port number. Or you may make it determine to use it by the explicit demand from a user.

[0112] The 1394-/IP service location processing facility 26 searches the terminal or service connected to 1394 buses, or receives the registration, and when it is recognized and required what kind of terminal/service should exist on 1394 buses, it has the function which notifies the information outside if needed. The 1394-/IP service location processing facility 26 has the

processing facility of a service location protocol (draft-ietf-svrlc-protocol-16.txt of the Internet draft) at least.

[0113] The service location redundancy 27 works a service location protocol in the form of the service location of IP base to a public network side. Moreover, it is not the service or the terminal connected to 1394 buses, i.e., IP base. Also about the protocol terminal only for IEEE1394 / service (in the 1st domestic network, they are the DVD player 8 and digital VTR 9 at digital [ 7 ] one TV and the 2nd domestic network) which can recognize and process only a series of 1394 protocols While this AV contact has the function which advertises these terminals / service by becoming these services or the substitute server of a terminal When the these-advertised service is received from a public network side (generally the IP side); it has the function which notifies them to 1394 and IP command conversion function 29 that it should map in the command of IEEE1394, or service.

[0114] The 1394AV command-processing function 28 is a processing facility of the terminal-control protocols (for example, a 1394 AV/C protocol, SBP, etc.) of IEEE1394.

[0115] the 1394-/IP command conversion function 29 has been sent using IP -- it is -- it is -- the control command (for example, RTSP (Real Time Stream Protocol) etc.; in addition) to send RTSP is explained in detail at Internet draft draft-ietf-mmusic-rtsp-02.ps, for example -- \*\*\*\* -- The terminal control command (for example, a 1394 AV/C protocol and the command of SBP) of IEEE1394 with which a 1394 bus top is sent is changed mutually, and it has the function notified to the other party.

[0116] Next, in the 2nd domestic network, the procedure of recognizing the terminal and service which exist on the procedure, i.e., the 2nd domestic network, in which the 2nd AV contact 5 acquires the information about the 2nd domestic network is explained.

[0117] An example of the sequence of the terminal / service collection procedure using a device peculiar to IEEE1394 is shown in drawing 3 . The configuration ROM in which the predetermined information about the terminal was written is stored in the terminal connected to 1394 buses, respectively. In drawing 3 , the 2nd AV contact 5 reads the configuration ROM of each equipments 8-11 connected with 1394 buses 3 (lead), and gathers information in each equipments 8-11. This information gathering may be performed to all the terminals that lead to 1394 buses 3.

[0118] Below, some examples are shown about the information described to Configuration ROM. Here, it explains taking the case of the configuration ROM of PC10. In addition, that what is necessary is to just be recognized as a "register" or "a part of room" in fact, although it learns from the specification of IEEE1394 and the phrase "ROM" is used in this example, also when it is not ROM (in the cases of RAM etc.), it shall contain.

[0119] The 1st example of the information described to Configuration ROM at drawing 4 is shown. This example describes the service which that PC10 other than the node information (for example, Vendor ID, node capability, etc.) (31 in drawing 4 ) which is the fundamental information about that terminal offers as unit information to Configuration ROM. That is, this PC10 has the WWW server and the digital album server function, and these are reflected in the contents of the configuration ROM (inside 32 and 33 of drawing 4 ). Thus, it not only explains what kind of terminal self is, but by describing to Configuration ROM, it becomes possible to make it know what kind of service self is offering to other terminals which lead to 1394 buses. Like especially PC, this function is very useful, when two or more functions are realized by one terminal. As information concretely described by Configuration ROM, they are types of services, the attribute (it is the various parameters used in order to receive the service, for example, they are the maximum data transfer rate, an equipment specification, an active parameter, etc.) of the service, etc.

[0120] By the way, it connects also with the home automation network 12, and PC10 also serves as a server of such home automation. That is, control of the various devices (here, there are an air-conditioner 13 and a microwave oven 14) connected with the home automation network 12 has composition which this PC10 performs. In other words, the terminal which leads to the 2nd 1394

bus 3 means that the various devices connected with home automation 12 network are controllable by accessing this PC10. In order to make the terminal on the 2nd 1394 bus 3 know this, the information (service information) about the home automation network 12 is also stored in the configuration ROM of PC10.

[0121] First, the information which shows that home automation service is offered is stored in Configuration ROM (34 in drawing 4 ). This may be made to recognize to be one unit on 1394 buses. Next, the information which shows that Aircon Service and microwave oven service are offered as this unit dependence directory is described by Configuration ROM, respectively (inside 35 and 36 of drawing 4 ). By doing in this way, other terminals which lead to 1394 buses can know now what kind of service is offered how also about the service connected to another network which is not 1394 buses, and recognition of service and the large improvement in the operability are expected.

[0122] Next, the 2nd example of the information described to Configuration ROM at drawing 5 is shown. In the 1st example, the 2nd example has also described the information according to terminal to Configuration ROM besides the description (inside 45-50 of drawing 5 ) about service to description about the service which the terminal offers having been performed as unit information about the terminal (inside 42-44 of drawing 5 ). These are stored as unit information, respectively and may be stored as a unit dependence directory, respectively. Moreover, in order to distinguish that they are the information according to terminal, and the information according to service, the field (respectively inside 42 and 45 of drawing 5 ) which shows those distinction (which unit is it?) may exist.

[0123] Here, the information about the terminal (an air-conditioner 13 and microwave oven 14) connected to PC10 through the home automation network 12 as information according to terminal is stored, respectively (inside 43 and 44 of drawing 5 ). By referring to these, not only the node connected with 1394 buses but the information about other nodes (at this example, they are an air-conditioner 13 and a microwave oven 14) connected to the node connected with the 1394 buses becomes possible [ obtaining on 1394 level ], and that of other 1394 nodes is very effective in integrative management and control of a domestic network.

[0124] Moreover, these are reflected in Configuration ROM as well as the 1st example when this PC10 has a WWW server, a digital album server function, etc. (inside 45-50 of drawing 5 ). The concrete Ruhr of the description is the same as that of the 1st example fundamentally.

[0125] Next, the 3rd example of the information described to Configuration ROM at drawing 6 is shown. This example is the case where only the information about PC10 self is stored. In this case, since the information as not the description that used service as the base but a node, i.e., the information as equipment about self, will be indicated unlike the 1st example and 2nd example, as unit information, the purport whose self is PC or a PC board (for example, 1394PCI board) is indicated.

[0126] Now, the actuation can be demanded from a user by displaying the terminal / service information on the 2nd domestic network collected with the 2nd AV contact 5 as mentioned above on the console of the 2nd AV contact 5 concerned. As the method of presentation in that case, it is also possible to perform the display according to service, and it is also possible to display the terminal base.

[0127] The example of a screen in the case of performing the display according to service to drawing 7 is shown. An icon (i1-i7) is prepared at a time according to [ one ] the service developed on the 2nd home network like drawing 7 , and a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface.

[0128] Here, the screen display of the icon according to service of drawing 7 does not ask a network classification, but is displayed similarly [ it is / the service connected to the 2nd IEEE1394 bus 3, and the service connected to the home automation network 12 / fair, and ]. This is because

it is generally thought that displaying fair as mentioned above is desirable for a user as for to which physical network the service has led in order to be uninterested. The derangement which will be produced when a user is made conscious of a physical network by this can be prevented.

[0129] In addition, there is no need of displaying the information itself written in Configuration ROM not necessarily in a screen, and you may make it display another corresponding information on it. For example, the information currently written in Configuration ROM is considered [ that it is generally a code for experts in many cases, and ], and is considered [ that it is the thin vocabulary of concordance in many cases, and ] by the general user. Though the code which means "digital one VCR" was written to Configuration ROM when the example was given, to Japanese people, this vocabulary has thin concordance. Then, it gets used by the general user and you may make it display it as "deep video" or deep "videocassette recorder" etc. instead of "digital one VCR" in such a case.

[0130] Next, the example of a screen in the case of performing the display according to terminal to drawing 8 is shown. An icon (i11-i15) is prepared at a time according to [ one ] the terminal developed on the 2nd home network like the case according to service, and a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface. Also in this case, by the screen display, a network classification is not asked but the service connected to the 2nd IEEE1394 bus 3 and the service connected to the home automation network 12 are displayed fair.

[0131] As mentioned above, it was the approach of recognizing a terminal or service by reading of the configuration ROM of 1394 buses.

[0132] Next, registration of service using a service location protocol is explained.

[0133] IETF which is the standardization engine of the Internet is examining registration of the service which used the service location protocol, and a retrieval method. these -- an object [ terminal / IP ] -- service -- beforehand -- some -- classifying -- (1) -- the positional information of the server which offers the service to a directory agent (it is also called a directory server in this operation gestalt) is registered according to those services. A user can know the location of service now by asking this directory agent.

[0134] (2) Prepare IP multicast address according to service. the user who is demanding a certain service -- the IP multicast address -- receiving -- " -- the service is where -- the message of the semantics ?" is flown. A user can know now the location of the server which offers the service because the server which offers the service responds to this.

[0135] It has come to be able to perform service registration and retrieval by the two approaches of saying.

[0136] With this operation gestalt, the 2nd AV contact 5 serves as a directory agent of the service location protocol of the above (1).

[0137] IP terminal on the 2nd domestic network (at drawing 1 , they are PC10 and a printer 11) registers the service currently offered into the 2nd AV contact 5 which is a directory agent. First, IP terminal investigates where [ on a network ] the directory agent exists, and completes the procedure for registering service information. It explains making into an example the case where PC10 registers service, and referring to drawing 9 about this.

[0138] PC10 sends out a service request message to the 2nd IEEE1394 bus 3. A service request message is a message of the semantics "the server which offers this service should reply", and more specifically than the case of this example sends out the message of the semantics "the server which offers the directory service should reply."

[0139] Since the target types of services are specified as a service request message, the "predicate" field is prepared, and it is described as a "directory service" to this field, and this message is further sent out by making the destination into the directory (agent DA) Discovery multicast address (IP address).

[0140] In this operation gestalt, in the 2nd domestic network, in order to use only as the 2nd

IEEE1394 bus 3 the network at which an IP packet arrives, the service request message sent out from PC10 reaches the 2nd AV contact 5 and printer 11 which are a directory agent.

[0141] The 2nd AV contact 5 which is the directory agent who received the service request message returns a "directory agent (DA) advertisement" to PC10, in order to notify that self is a directory agent. In addition, since self is not a directory agent, a printer 11 disregards a service request message (a link layer does not usually receive).

[0142] Next, PC10 is receiving a directory agent (DA) advertisement, and a directory agent recognizes existing in the 2nd AV contact 5.

[0143] Next, PC10 performs registration to the directory agent of the service which self offers. With this operation gestalt, PC10 can receive the service request from the outside as a substitute server also about service of the air-conditioner 13 and microwave oven 14 which are further connected with the home automation network 12 while self offers WWW service (concretely http server) and digital album service.

[0144] While PC10 registers the positional information, attribute information, etc. in service registration about each of the WWW service which PC10 self offers, and digital album service, instead of an air-conditioner 13 and a microwave oven 14, the positional information, attribute information, etc. are registered also with each service on the home automation network (LON) 12.

[0145] An example of the contents of the registration information on WWW service and digital album service is shown in (a) of drawing 10, and (b), respectively. URL containing the port number determined as the IP address of PC10 for every service as positional information of WWW service and digital album service is used.

[0146] Moreover, an example of the contents of the registration information on Aircon Service for which PC10 acts to (c) of drawing 10 and (d), respectively, and microwave oven service is shown. In this case, the port number of PC10 is assigned to each substitute service. In the example of drawing 10, 15000 is assigned to Aircon Service on LON and 15001 is assigned to microwave oven service on LON. By this, if, as for an external terminal, Aircon Service and microwave oven service exist on PC10, moreover, these services will be interpreted as their being services on IP level with \*\*\*\*\*.

[0147] When it wants to access the port number 15000 of PC10 when an external terminal wants to access Aircon Service of the home automation network 12, and to access microwave oven service, it accesses the port number 15001 of PC10. When it is interpreted as on the other hand it being a service request for air-conditioners when PC10 is accessed by the port number 15000 and accessed by the port number 15001, it is interpreted as it being a service request for microwave ovens, and the control command of passed IP is translated into the control command of LON, and this is turned and sent out to the actual device on the home automation network 12 (an air-conditioner 13 or microwave oven 14). About this actuation, it mentions later taking the case of access to Aircon Service.

[0148] Thus, by service registration of drawing 9, WWW service, digital album service, Aircon Service on LON, and the microwave oven service on LON will be registered into the 2nd AV contact 5. If service registration is successful, the 2nd AV contact 5 which is a directory agent will turn service acknowledgement (ACK) to PC10, and will be returned.

[0149] In addition, registration of printer service is similarly performed from a printer 11 to the 2nd AV contact 5.

[0150] As mentioned above, it will register with WWW, a digital album, an air-conditioner, a microwave oven, and the 2nd AV contact 5 each the service of a printer of whose is a directory agent in the procedure of registration of a service location protocol.

[0151] Now, it is possible to constitute the service information on the 2nd domestic network together with the information acquired by this registration procedure and the information acquired by reading of the configuration ROM on IEEE1394 which gave point explanation.

[0152] Although the configuration approach can consider various classes With this operation

gestalt, as the example about the service registered with (i) service location protocol this -- preferential -- displaying -- (ii) -- the service which does not appear here -- specifically Are the node which is not recognized in a service location protocol, and about the node recognized in reading of the configuration ROM on IEEE1394 It is the approach of constituting service information based on the information on Configuration ROM, combining the information on both (i) and (ii), and introducing to a user and the exterior as one "service directory information on the 2nd domestic network."

[0153] The WWW service, the digital album service, Aircon Service, the microwave oven service, the printer service and the DVD player service recognized by reading of the configuration ROM on IEEE1394 recognized in the procedure of registration of a service location protocol, and video service are more specifically doubled, and all services are recognized. And an icon (i21-i27) is displayed at a time according to [ one ] the service developed on the 2nd home network on the console of the 2nd AV contact 5, for example like drawing 7 . Moreover, a user becomes possible [ accessing the service (by for example, thing clicked or dragged and dropped using mouse equipment) ] by directing service using by the predetermined user interface like the above-mentioned.

[0154] By the way, although the user agent who is the user terminal which receives offer of service can ask a directory agent the information about the service on the IEEE1394 bus to which self is connected and can also obtain it instead, with the registration procedure of the information about service to the directory agent who mentioned above, and the same procedure, he is with self receiving the notice from each equipment, and can also obtain the information about service.

[0155] Next, the case where the user (that is, user of the terminal connected to 1394 buses 1) of the 1st domestic network operates the terminal in the 2nd domestic network (that is, terminal connected to 1394 buses 3 or the home automation network 12) by remote control, and does desired actuation through a public network 2 is explained.

[0156] As shown in drawing 1 , the 1st domestic network and the 2nd domestic network interconnect with the public network 2. As mentioned above, a telephone network may be used and it may be [ whose public network 2 is ] like the circuit of a wide band, or a dedicated line the Internet. Moreover, a private IP address or a global IP address shall be used for an IP address (when a public network 2 is the Internet). (when a public network 2 is not the Internet but ISDN etc.)

[0157] Here, the 1st AV contact 4 shall be the directory agent of the 1st domestic network, and shall recognize the service in a network with the same procedure as what explained the 2nd AV contact 5 previously. PC6 and digital [ 7 ] one TV are recognized as a terminal, and, more specifically, a certain service and digital TV service which are offered with PC6 as service are recognized.

[0158] Now, in order to show the service in the 2nd domestic network to the user of the 1st domestic network as first phase, the 1st AV contact 4 tries to collect the service information on the 2nd domestic network (directory information). The 1st domestic network and the 2nd domestic network shall communicate in Internet Protocol in that case. In addition, the technique of this operation gestalt can be similarly applied, when another protocol, for example, IPX, NetBEUI, etc. are used.

[0159] An example of the procedure of information interchange performed to drawing 12 between the 1st AV contact 4 and the 2nd AV contact 5 for collection of service information is shown.

[0160] First, the 1st AV contact 4 sends out the service request which made "predicate" the directory agent towards the 2nd domestic network in order to search the directory agent in the 2nd domestic network. In order to realize this, how to make for example, the number of hop into plurality, and to send an IP multicast (making it a scope include other domestic networks), the approach of sending to the above-mentioned IP multicast address, after attaching source routing or a routing header to the 2nd domestic network, etc. can be considered.



[0161] Here, as an approach of getting to know the IP address, especially IP subnet address (namely, network address) of a house of the other party, for example to the house of the other party, routing information is exchanged by the routing protocol and how to get to know the address of the other party etc. can be considered.

[0162] Now, the 2nd AV contact 5 which is the directory agent of the 2nd domestic network who received this service request tells a directory agent advertisement to the 1st AV contact 4, in order that self may tell the purport which is a directory agent.

[0163] Next, the 1st AV contact 4 sends a service type request to the 2nd AV contact 5, in order to know what kind of service is offered in the 2nd domestic network.

[0164] The digital VTR (this DVTR1394) whose 2nd AV contact 5 is the air-conditioner (this aircon\_lon) connected to LON other than WWW (the service name written by URL is http), a digital album (this album), and a printer (the said lpr) as a service type reply, the microwave oven (this microwave\_lon) connected to LON, the DVD player (this DVD1394) which is 1394 terminals, and 1394 terminals is notified. For example, as shown in drawing 12, "Service:http://", "Service:album://", "Service:lpr://", "Service:aircon\_lon://", "Service:microwave\_lon://", "Service:DVD1394://", and "Service:DVTR1394://" are notified.

[0165] About the device connected to LON, the service information (URL information showing the location of service) notified from PC10 is notified to the 1st AV contact 4 as it is. That is, about the service registered with the service location protocol of IP, it has notified to the 1st AV contact 4 as it is.

[0166] About the service which the 2nd AV contact 5 which is the directory agent of the 2nd domestic network has recognized only as 1394 terminals / service In order to try for the 2nd AV contact 5 self which is a directory agent to offer service as a substitute server of the service It is introducing to the 1st AV contact 4 on IP in the semantics of "DVD on 1394", and "DVTR on 1394" using the new service category "service:DVD1394" and "service:DVTR1394."

[0167] Next, the 1st AV contact 4 which received these information goes into the procedure for collecting the detailed information about each received service.

[0168] An example of the collection approach is shown below. That is, about the service which is [ among those ] interested for the 1st AV contact 4 side about all services received by the above-mentioned service type reply, in order to acquire the location and attribute information, a service request and an attribute request are sent to the 2nd AV contact 5 which is a directory agent, respectively. To a service request, it is answered to a service reply (URL : URL; (for example, Service:DVD1394:// 192.168.1.254:20000) which is specifically the location information on the service), and is answered to an attribute reply (attribute information [ on the service ];, for example, attribute information on DVD on 1394) to an attribute request. In addition, for details, it is described by the documents (for example, draft-ietf-srvloc-protocol-16.txt of the Internet draft etc.) of a service location protocol.

[0169] Although the above-mentioned procedure about DVD1394 service is described to drawing 12, if information is similarly collected about all services the outside of it, the 1st AV contact 4 can collect the service information on the 2nd domestic network like drawing 13.

[0170] Here, about each service of DVD1394 and DVTR1394, as stated also in advance, the 2nd AV contact 5 can receive the service request from the outside now as a substitute server of these services. That is, instead of 1394 nodes, the 2nd AV contact 5 receives the remote command protocol which is the embodiment of concrete service and which is a protocol of IP, and this is changed into 1394 nodes and 1394 protocols, and is made into them (in addition, it mentions later about the detail). Since it can introduce through the service introduction protocol of IP which is the protocol which does not ask a network about the service (here, they are DVD service and DVTR service) whose exchange is originally possible by doing in this way with 1394 protocol, a network is not asked but it becomes sending of the command to the 1394 above-mentioned node, and controllable from IP node of arbitration (it becomes good control).

[0171] The AV contact 5 of [ 2nd ] the information collected by various replys assigns the port number used as the service window, i.e., the port number for each substitute service, about \*\*\*\*\* service (DVD service and DVTR service) in a substitute. Allocation may be beforehand made by the standardization engine etc. and this port number may be decided by the negotiation of nodes. In the case of this operation gestalt, it is made [ service / on 1394 / DVD ] into 20001 about the DVTR service on 20000 and 1394. By this, moreover, it interprets an external terminal (for example, terminal on the 1st domestic network) as it being service on IP level while it interprets the above-mentioned service as existing on the 2nd domestic network.

[0172] Now, like drawing 14 , on the console, the terminal 4 on the 1st domestic network, for example, 1st AV contact, is a form of the list display of the service which self recognizes, and, in addition to the information about the 1st domestic network, it is displayed based on the information acquired on said service location also about the information on service on the 2nd domestic network (for example, domestic network of OO Mr. \*\*). The method of this display may be based on the same plan as the thing of drawing 11 .

[0173] Next, when an external terminal wants to access various services 2nd domestic [ LAN ], the address and the port number which are introduced by URL of drawing 13 are accessed, respectively.

[0174] For example, a user operates the 1st AV contact 4, brings an image through a public network 2 from the DVD player 8 which are 1394 terminals on domestic [ 2nd / LAN ], and the case where this is projected on digital [ 107 ] one TV is considered.

[0175] Actual actuation of a user is as follows, for example. A user clicks on the icon of the DVD player of drawing 14 first. Then, the manual operation button group for DVD player actuation like drawing 15 is displayed on a screen, for example. Next, a user clicks a desired manual operation button and operates the DVD player 8 by remote control. Moreover, a click etc. specifies that an accepting station is digital [ TV ] by a certain input approach.

[0176] An example of the sequence about the command group which flows an actual network top to drawing 16 at this time, and a protocol group is shown.

[0177] First, the 1st AV contact 4 slushes an image into digital [ 7 ] one TV, and it operates the following sequences so that it may perform a setup for displaying this. That is, according to IEC1883 protocol, the synchronous channel on the 1st IEEE1394 bus is secured. At this time, the synchronous channel number of the acquired synchronous channel presupposes that it is #y.

[0178] Next, the 1st AV contact 4 sends a command using the control command (for example, 1394 AV/C protocol) with which it was beforehand set in standardization organizations, such as 1394TAs, in order to turn ON a power source digital [ TV / 7 ] and to project the image from synchronous channel #y on a screen. If a command is received, you may make it return ACK to the 1st AV control unit 4. It means that the circuit from the 1st AV contact 4 to digital [ 7 ] one TV was secured by this.

[0179] Getting [ or ] mixed up with this, the 1st AV contact 4 publishes the command to the DVD player 8 to the 2nd AV control unit 5-like in parallel. Here, the DVD player 8 is interpreting the 1st AV contact 4 as it being IP service. A command is published to the port of the substitute server of the 2nd AV contact 5 (IP address = 192.168.1.254), 20000 [ i.e., ].

[0180] Here, as a command for remote operation, RTSP (RealTime Streaming Protocol) is used, for example. RTSP is a protocol for controlling a remote real-time signal, and it has a discussion in IETF which is the standardization engine of the Internet. For details, it is indicated by Internet draft draft-ietf-mmmusic-rtsp-02.ps.

[0181] The 1st AV contact 4 publishes a command (for example, the SETUP command and the PLAY command) required in order to reproduce the DVD player 8 on RTSP.

[0182] The 2nd AV contact 5 which received the SETUP command of RTSP interprets it as the control to the DVD player 8 being started from now on, and performs reservation of the band for image transmission on the 2nd IEEE1394 bus 3 to which the DVD player 8 is connected, i.e., a

synchronous channel. This is performed by IEC1883. Here, the secured synchronous channel number is set to #y. A band may be good also as using experiential values (for example, if it being MPEG 6Mbps(es) etc.), and may include desired value into a message.

[0183] Moreover, the 2nd AV contact 5 which received the PLAY command of RTSP publishes a command to the DVD player 8 with the corresponding command (for example, a command called DVD-PLAY shall specify) to which this was specified as protocols between 1394 terminals, such as 1394 commands, i.e., a 1394 AV/C protocol etc.

[0184] Conversion of such a command is performed by the 1394-/IP command conversion function 29. The flow of the processing is explained referring to drawing 17. The command on IP is received by the service location redundancy 27. Command conversion of the received command is carried out by the 1394-/IP command conversion function 29. As it was called the table 61 corresponding to a command for DVD, and the table 62 corresponding to a command for DVTR, it prepares according to service of the table which described the relation between the command on IP (or actuation), and the command on 1394 (or actuation), the command sent by IP based on the table according to these services is changed into the command of 1394, and, specifically, delivery sending out is directed for this to the 1394AV command-processing function 28. And sending out of an actual command is performed by the 1394AV command-processing function 28 in which directions were received.

[0185] In addition, a procedure becomes the same, when a command flows in the direction contrary to the above, namely, also when 1394 commands are inputted and it changes and outputs this to the IP command. That is, 1394 commands are received by the 1394AV command-processing function 28, this is changed into the IP command based on the table according to service in the 1394-/IP command conversion function 29, and this is sent out by the service location redundancy 27.

[0186] Now, if it does in this way and a command reaches the DVD player 8, transmission of actual image data will be performed through synchronous channel #x of the 2nd 1394 bus 3. After an ACK signal returns (an ACK signal may be changed in addition into O.K. of RTSP on public networks (ISDN or Internet)), as for this, actual data transfer is started.

[0187] The 2nd AV contact 5 sends out image data to a public network 2 through the data link switch 22. This may be sent in an MPEG multiplex form in that case.

[0188] The sent-out image data are sent to the 1st AV contact 4 through a public network 2. The 1st AV contact 4 sends the received image data to synchronous channel #y of the 1st 1394 bus 1 through the data link switch 22, and, finally image data are reproduced in digital [ 7 ] one TV. Consequently, the 1st user domestic [ LAN ] can see now the image from the DVD player 8 on domestic [ 2nd / LAN ] in digital [ 7 ] one TV.

[0189] In addition, as mentioned above, it is desirable that the FANP processing facility 25 or other RSVP processing facilities realize the band in the data link layer of the transmission route of image data, reservation of a virtual transmission-line identifier, and adjustment. By using FANP etc., it becomes securable [ the communication resource which does not ask network classification ]. An example of the sequence at the time of making it such is shown in drawing 18. In drawing 18, reservation of the communication resource of the data link which serves as a path of image data by FANP, adjustment of an identifier, a setup of a contact, etc. are performed in advance of sending of actual image data.

[0190] Next, it considers that the 1st user domestic [ LAN ] operates the 1st AV contact 4, and operates the air-conditioner 13 (it is a LON terminal) on domestic [ 2nd / LAN ] as other examples of remote operation through a public network 2.

[0191] Actual actuation of a user is as follows, for example. A user clicks on the icon of the air-conditioner of drawing 14 first. Then, the manual operation button group for air-conditioner actuation is displayed on a screen, for example. Next, a user clicks a desired manual operation button and operates an air-conditioner 13 by remote control.

[0192] An example of a sequence is shown about the command group and protocol group which flow an actual network top to drawing 19 at this time.

[0193] First, the 1st AV contact 4 publishes the command to an air-conditioner 13 to PC10 of a substitute server shown on a service location. Here, the 1st AV contact 4 is interpreted as it being IP service whose PC10 offers the air-conditioner 13. A command is published to the port of PC10 which is a substitute server, 15000 [ i.e., ].

[0194] Here, CCCP (Cam CoderControl Protocol) can be used as a command for remote operation. Although CCCP is a protocol for performing control of a remote camcorder through the Internet, control of various electrical machinery and apparatus shall be possible at the same view, and the command group for air-conditioners shall exist in CCCP especially. In addition, the detail of CCCP is indicated by Internet draft draft-ohta-ccc-video-00.txt.

[0195] The 1st AV contact 4 publishes a command (POEWR\_ON command) required to turn ON the power source of an air-conditioner 13 on CCCP.

[0196] PC10 which received the POWER\_ON command of CCCP publishes a command for an air-conditioner 13 with the corresponding command (for example, a command called LON\_POWER\_ON shall specify) to which this was specified as a protocol between the LON command and a LON node.

[0197] Conversion of such a command is performed within PC10. The flow of the processing is explained referring to drawing 20 . The service substitute reception function 71 receives the command on IP. Command conversion of the received command is carried out by the CCCP/LON command conversion function 72. The table corresponding to a command for LON, i.e., the table which described the relation between the command on IP (or actuation) and the command on LON (or actuation), is specifically prepared in the CCCP/LON command conversion function 72, it changes into the command which should be sent to an air-conditioner 13 through LON from the command sent by CCCP based on this table, and delivery sending out is directed for this to the LON command issue function 73. And sending out of an actual command is performed by the on-command issue function 73 in which directions were received.

[0198] A procedure becomes the same, when a command flows in the direction contrary to the above, namely, also when the LON command is inputted and it changes and outputs this to the CCCP command.

[0199] In addition, when an ACK signal returns (the ACK signal is shown in addition as O.K. in; drawing 19 which may be changed into O.K. of CCCP on public networks (ISDN or Internet)) This is also notified to the 1st AV contact 4.

[0200] In addition, it cannot be overemphasized that the mechanism explained with this operation gestalt can be applied not only to a domestic network but to a general company network and the network technique for realizing especially the so-called "mobile environment."

[0201] Moreover, although this operation gestalt explained as a protocol of a network layer, using IEEE1394 and LON as a protocol of IP and a data link layer, it is also possible as a protocol of a network layer DSM-CC which is advancing the standardization by DAVIC, and to use techniques, such as Ethernet and ATM, as a protocol of data link layers, such as IPX.

[0202] By the way, although the function of service location service and the function of command conversion were prepared in AV contact and AV contact offered service with the above-mentioned operation gestalt, the node which is performing AV contact of this operation gestalt, i.e., network interconnect, does not need to perform these functions, for example, it prepares in PC6 or PC10 in drawing 1 , and service may be made for them to provide.

[0203] in this case, like the case where AV contact of drawing 2 has realized service Network I/F (equivalent to 1394 I/F21 of drawing 2 R> 2), the IP processing facility 24, the 1394 / IP service location processing facility 26, the service location redundancy 27, the 1394AV command-processing function 28, and 1394 / IP command conversion function 29 The control to which mount in the node of PC6, PC10, or others, and a network communication resource is made to secure

further, What is necessary is just to mount the FANP processing facility 25 or the control processing facility by RSVP, when network control, such as control which adjusts the identifier used between networks, is required.

[0204] Moreover, it is also possible to mount the function of service location service and the function of command conversion for differing mutually.

[0205] In addition, although a private IP address is used for the IP address of a terminal when a public network 2 is not the Internet but ISDN etc., or a global IP address shall be used for the IP address of a terminal in the above explanation when a public network 2 is the Internet For example, address translation, such as NAT (Network Address Translation), is used. When a public network 2 is the Internet, a global IP address is used for the node ( drawing 1 AV contact terminal) which interconnects a network at least, and you may enable it to use a private IP address for other nodes. In this case, from an external network The global IP address of the node which interconnects a network, A group with the port number for pointing to the private IP address (or group of a private IP address and a port number) of the node used as the destination is made into the destination. Transmit an IP packet and a table is referred to in the node which interconnects a network. You may make it change the group of the global IP address and a port number concerned into the private IP address (or group of a private IP address and a port number) of the node used as the destination.

[0206] (2nd operation gestalt) This operation gestalt explains the case where 1394 equipments by which PC with an IEEE1394 interface was connected to the 1394 same buses are recognized and used.

[0207] Generally, various equipments may be connected to 1394 buses and PC does not have the driver software for controlling the information and it about all the equipments connected beforehand.

[0208] So, with this operation gestalt, information on the equipment connected to 1394 buses is collected. The outline of the procedure is as follows:

[0209] i) 1394unit is recognized first. Specifically, it is unique of 1394 nodes. ID and a unit number are acquired.

[0210] ii) Next, category distinction of each unit is performed. And it judges whether it is a category corresponding to a registered logical device.

[0211] An occupancy condition is acquired about iii, next a registered device (a standard driver is used still in this case).

[0212] iv) And the occupancy condition of 1394unit(s) which are not registered is judged.

[0213] Moreover, with this operation gestalt, the following are treated as an event which occurs in asynchronous and changes the configuration of a device driver.

[0214] i) Bus reset of the use demand iiIEEE1394 interface of the equipment by application (addition of 1394 equipment, deletion)

iii This operation gestalt is explained in detail below modification of the occupancy condition of equipment.

[0215] First, a hardware configuration is explained.

[0216] The example of a configuration of PC applied to this operation gestalt at drawing 21 is shown. the main memory by which, as for 82, the processor was connected [ 81 ] to the local bus of a processor for PC, as for 83 -- 84 -- a system bus -- 86 and 87 express an IEEE1394 interface and, as for 88, 85 expresses a hard disk for secondary storage, respectively.

[0217] Secondary storage 85, the IEEE1394 interface 86, and the IEEE1394 interface 87 are connected to the system bus 84, respectively. Secondary storage 85 is constituted by the flash EEPROM.

[0218] The hard disk 88 is connected by the IEEE1394 interface 87 in the interior of the case of PC81.

[0219] The IEEE1394 interface 86 is connected to the printer 90 placed out of the case of PC81,

FAX91, massage equipment (it is only called massage equipment below; used as reclining seat mold massage equipment) 92, and a toaster 93, respectively. In addition, on explanation, FAX91 shall have a unit corresponding to a FAX function and scanner ability, and a unit corresponding to printer ability, and massage equipment 92 shall have a unit corresponding to the massage device to upper-half-of-the-body parts, such as the back and a neck, and a unit corresponding to the massage device to lower-half-of-the-body parts, such as a guide peg.

[0220] Next, the software structure of an operating system (the following, OS) is explained.

[0221] An example of the software structure in PC81 of this operation gestalt is shown in drawing 22.

[0222] In the interior of OS of drawing 22, in 101, the logical device function manager of OS and 102 express a secondary-storage function manager, and 103 expresses 1394 interface management functions, respectively.

[0223] OS manages secondary storage 102 and a hard disk 103 directly. On the other hand, about each hardware of a printer 90, FAX91, massage equipment 92, and a toaster 93, recognition and registration of a device are performed through 1394 function managers (about this procedure, it mentions later).

[0224] 111,112 is a device driver which the subordinate of the secondary-storage function manager 102 has, and controls secondary storage 85 and a hard disk 88, respectively. 113,114 is a device driver which the subordinate of 1394 interface management functions 103 has, and controls the IEEE1394 interfaces 86 and 87, respectively, respectively.

[0225] OS of drawing 22 API (Application Programing Interface) and JAVA 121 expresses a 1394 management object between APIs.

[0226] JAVA of drawing 22 SPI (System Programing Interface) and JAVA In between APIs 122 expresses a logical device management object. 131,132,133,134, respectively A modem, A printer, a scanner, and the logic device-class object that corresponds unknown are expressed. 131-1-2,132-1,133-1,134-1-3 express the logical device object managed by the logic device-class object of 131,132,133,134, respectively (about the detail of an unknown class, it mentions later).

[0227] OS of drawing 22 API and JAVA In between SPIs 151 to unit1 (104 in drawing 2222) of a printer 90 To unit1 (105 in drawing 22) of FAX91, 153 152 to unit2 (106 in drawing 22) of FAX91 154 expresses the physical device object corresponding to unit1 (109 in drawing 22) of a toaster 93 in 156 corresponding to unit2 (108 in drawing 22) of massage equipment 92 in 155 to unit1 (107 in drawing 22) of massage equipment 92, respectively. Moreover, 161, 162, and 163,164,165,166 express the driver object corresponding to the physical device object of 151-156, respectively.

[0228] An arrow head expresses the reference relation of each object in drawing 22. By having reference relation, the method of the object of a reference place can be started and a state variable can be read. For example, the physical device objects 151-156 mean being registered as a physical device object which the subordinate of a 1349 management object has by having the reference relation which starts in the 1394 management object 121. 151 is registered into the logical device object 131-2 of a printer class, the driver object 161 is registered into the physical device object 151, and other things are the same.

[0229] Next, initialization of OS is explained.

[0230] After powering on, PC81 reads the program stored in secondary storage 85, and starts OS. Although not asked especially about the general specification of OS, the compiled Java code shall be performed on OS. In addition, it is Java although there is various reference about Java. Language Specification It is explained in detail at <http://java.sun.com>.

[0231] With this operation gestalt, the hard disk 88 connected to the IEEE1394 interface 87 is beforehand decided as 1394 equipments directly managed by OS. PC81 is unique of the IEEE1394 interface of PC81 self to the register with which it operates "Look an IEEE1394 device like [ the writing or read-out of a value to a register ]", and the hard disk 87 was defined beforehand. By writing in ID shows that PC81 with the IEEE1394 interface 87 uses a hard disk 88 exclusively.

[0232] OS of PC81 has API (Application Programing Interface) which can perform issue and a response of the transaction request of an IEEE1394 interface from a Java program. The Java code which manages the IEEE1394 device connected to each 1394 interfaces through Above API is performed after starting of OS by initialization of PC81. This is called a 1394 management object. Moreover, OS shall be equipped with the dynamic object loading device which obtains the identifier of the code which corresponds from the identifier of an object class, and generates an object.

[0233] Below, the object by which xx class object and a certain class were substantiated in the object in connection with the xx code and a certain whole class for storing of the Java code and a transmission gestalt is called xx object. For example, Java of the equipment corresponding to a logic device-class object and each physical unit for the object which manages a certain type of all logical units. The object which offers API is called a logical device object. Moreover, a certain identifier shall be given to the code of an object and it shall be discriminated from other objects. The identifier may be embedded at object code and may be expressed by the address of ISO1212 format that the file name or it which stores it is stored. On the other hand, the identifier discriminable from other objects shall be given to a meaning by the PC concerned at least at the object. For example, it is the address of the virtual-memory space where an object is stored. In case it is used by IEEE1394 bus, as for an identifier, to be identified by the meaning on an IEEE1394 bus is desirable.

[0234] Next, recognition of a physical unit is explained.

[0235] Completion of initialization of 1394 interfaces by OS generates the 1394 management object 121 and the logical device management object 122. The 1394 management object 121 and the logical device management object 122 hold mutual reference, and they perform recognition and registration of a device, exchanging information mutually.

[0236] The 1394 management object 121 collects the information on the equipment connected to the IEEE1394 interfaces 86 and 87, and recognizes 1394 nodes each. However, the hard disk 87 with which OS was beforehand defined as what is used exclusively at the time of initialization of the 1394 management object 121 is excepted from recognition. The 1394 management object 121 is node in the TOPOLOGY\_MAP register or SPEED\_MAP register which 1394 interfaces each of PC81 have through the above-mentioned 1394 control API. The read-out demand of a configROM field is published to each node for every ID, and it is unique of the node concerned. It will be each unit if ID and unit recognize two or more existence. ID and capability are obtained. The format of these registers is IEC. It is set by 1212 (ANSI/IEEE Std 1212 Control and Status Register(CSR) Architecture for Microcomputer Buses[ISO/IEC13213]); and, for details, omits here.

[0237] Finally the 1394 management object 121 is unique. The list of groups of ID, unitID, and capability is obtained, and these devices are registered. The 1394 management object 121 reads the value of the above-mentioned register from a printer 90, FAX91, massage equipment 92, and a toaster 93, and generates the 1394 physical-unit objects 151-156 corresponding to each unit. FAX92 and massage equipment 93 have two unit(s), and generate the physical device object 152,153,154,155 which corresponds, respectively. If generation of an object is completed, the 1394 management object 121 will notify completion of physical device registration to the logical device management object 122.

[0238] The equipment removed from the object of recognition is good also as not considering as the object of recognition, when the value which the own register of equipment other than the equipment beforehand occupied by OS expresses occupancy, and shows occupancy there is written in.

[0239] Here, before explaining registration, the structure of a program (here, it is called an object) and actuation which control a device are explained.

[0240] It corresponds to the function of each equipment and 131-1,132-1 and the logical device object of -- provide application with I/O API. Each logical device object is managed by logic device-class objects prepared for every classification, such as a file and a printer. Although each



logical device object belongs to only one logic device-class object, one logic device-class object may have two or more logical device objects in a subordinate. For example, although the logical device object 131-1 of a printer belongs to only one logic device-class object 131, the subordinate of the logic device-class object 131 of a printer has two logical device objects of 131-1,131-2.

[0241] A physical device object exists in 1394 units and 1 to 1 correspondence. One physical device object may be referred to from two or more logical device objects. For example, the physical device object 152 is referred to from two logical device objects, the logical device object 131-1 of a printer, and the logical device object 133-1 of FAX, while it supports unit1 of a printer 91.

[0242] With this operation gestalt, PC81 shall have a printer, a scanner, FAX, and the logic device-class objects 131-134 corresponding to each unknown device class. Each logic device-class object is [ -- It has n. ] the logical device object 131-1 to the subordinate. -- It is n and 132-1. -- It is n and 133-1. -- It is n and 134-1. The physical unit with which the Java application performed with PC81 belongs to the difference in mounting of a physical unit through these logical device object at the class of \*\*\*\*\* identitas can be used by the same approach. This is Java for every logic device-class object. It is because SPI is communalized.

[0243] For example, the address and the procedure of an IEEE1394 register at the time of accessing printer equipment are ANSI. X3T10 Serial Bus It is set as Protocol (SBP). A printer is controllable, if a device driver generates the message of an IEEE1394 format in accordance with Above SBP no matter an IEEE1394 interface may be mounting [ what ]. Furthermore, if the device driver is described by Java independent of hardware or OS, as long as the system program interface to the driver of an IEEE1394 interface is the same, in any OS's, the same printer device driver is usable.

[0244] Application can obtain the list of the logic device-class objects 131-134 by requiring a device-class list of the logical device management object 122. The list of the logical device objects belonging to the same types, such as each printer and a scanner, can be obtained from a logic device-class object. The logical device management object 122 also performs management of registration/deletion of a logic device-class object.

[0245] Next, initialization of the logic device-class object by the logical device management object 122 is explained. An example of a logical device management object initialization procedure is shown in drawing 23.

[0246] The logical device management object 122 generates the logic device-class object 131,132,133 corresponding to the device class defined beforehand, a printer, a scanner, and FAX, and makes reference between these objects shown by the arrow head in drawing 2 (steps S11-S14).

[0247] Each logic device-class object of these 131,132,133 initializes following generation (; step S15 to which the logical device management object 122 waits for the completion of initialization in the meantime). Completion of initialization notifies that initialization was completed to the logical device management object 122.

[0248] The logical device management object 122 which received the notice of completion generates and initializes the unknown logic device-class object 134 which manages the physical device which finally has not been recognized by each logic device-class object of 131-133 (steps S16 and S17). The logical device management object 122 will be in the completion condition of initialization, if the notice of completion of initialization of an unknown class is received (step S18).

[0249] Next, it explains, taking the logic device-class object 131 for an example about initialization of a logic device-class object. An example of a logic device-class object initialization procedure is shown in drawing 24.

[0250] The logical device management object 122 passes the reference to the 1394 management object 121 to the generate time of a logic device-class object. The logic device-class object 131 requires the reference to a physical device object of the 1394 management object 121 (step S21).

[0251] The 1394 management object 121 will return reference in an order from the physical device

object 151 according to the reference which the self-object holds, if reference of a physical device object is required.

[0252] When the reference to the physical device object 151 comes to hand, the logic device-class object 131 starts the attribute value acquisition method of an object 151, and is unique. ID, unit ID and capability are acquired (step S22). These values have beforehand the table which judges whether it agrees in self-device class, and the logic device-class object 131 can judge whether the acquired physical device object 151 agrees in a self-class.

[0253] unique of a physical device 151 ID, unit Since ID was a value which shows a printer, the logic device-class object 131 generates the logical device object 131-1 corresponding to the physical device object 151, and makes initialization start. Also at this time, as for a logic device-class object and a logical device object, it has reference relation mutually, and the logical device object 131-1 is registered as a subordinate of the logic device-class object 131 (steps S23-S24).

[0254] This judgment is unique. ID, unit The combination of not only ID but other attribute value may perform. Moreover, it is unique, without a logic device-class object having a table. ID and unit You may ask the retrieval server which is out of PC81 by using ID as a key.

[0255] Hereafter, succeedingly, the logic device-class object 131 requires the reference to a physical device of the 1394 management object 121, and does the same activity even to the last physical device 156 about 152, 153, and --. Since unit2 of FAX152 has capability of a printer, this is also registered into a printer class object as a logical device object 131-2 (steps S21-S24).

[0256] After an activity is completed about all physical device objects, it waits for the notice of the completion of initialization from the registered logical device object 131-1,132-2 (step S25). If the notice of the completion of initialization from the logical device object 131-1,132-2 is received, the logic device-class object 131 of a printer class will notify completion of initialization to the logical device management object 122 (step S26).

[0257] Next, it explains, taking the logical device object 131-1 for an example about initialization of a logical device object. An example of a logical device object initialization procedure is shown in drawing 25.

[0258] After the logical device object 131-1 initializes own attribute value, it publishes an initialization demand to a physical device 151, and waits for the notice of completion from 151 (steps S31 and S32). Reception of the notice of completion publishes the notice of completion to the logic device-class object 131 of a printer class (step S33). The physical device object 151 which received the initialization demand determines the device control code corresponding to a physical unit 90, reads it, generates the device control object 161, and registers it into a physical device object.

[0259] Next, it explains, taking the physical device object 151 for an example about initialization of a physical device object. An example of a physical device object initialization procedure is shown in drawing 26.

[0260] In addition, generation of a physical device object is performed by the 1394 management object 121 before generation of a logical device object, and when, as for initialization here, the 1394 management object 121 generates the physical device object 151 unlike generation, the code of a printer control proper is not read.

[0261] The device control code to load is determined as follows, for example. The 1394 management object 121 is attribute value unique. ID, unit It is the attribute value unique to which it has the table which searches for the class name of a device control code from ID, capability, and a logic device-class object, and self has the physical device object 151 in the 1394 management object 121. The inquiry demand containing ID, unitID, and capability is published, and a class name is acquired as the return value (step S41). The identifier of a device control code is good at the pathname which shows the file of the PC concerned as mentioned above. Of course, the inquiry based on attribute value may be published and acquired to the exterior of PC81.

[0262] A device control code is loaded by the dynamic object loading function from the class name

acquired by the above-mentioned approach, the device control object 161 is generated, and it registers with the physical device object 151. The physical device object 151 publishes the initialization demand of hardware, after initializing attribute value of the device control object 161 (steps S42-S44).

[0263] It will be read if the code corresponding to a class name exists locally. If the class name shows the resource on the network of RIMOTO, it will acquire from on a network. When it does not exist locally [ even when the class name has not pointed out the resource on a network clearly / a code ], the location on a network is acquired using the retrieval server on a network etc., and a code is read.

[0264] Next, the device control object 161 prepares the packet which performs the register writing for initialization of hardware, and initializes a call and a physical unit 90 for the system call of 1394 transactions. If initialization is completed, the physical device object 151 will publish the notice of completion to the logical device object 131-1 (step S45).

[0265] By the way, the thing registered into two or more logical device objects (131-1,133-1) like [ a physical device object ] the physical device object 152. Such a physical device object will receive two initialization demands or more. In the 2nd initialization, if it compares whether it is the same as that of the device control object which the device control object determined from attribute value gained at a time (step S44), and same and it is [ the same thing is used and ] different, a device control object will newly be read and generated. Although the same device control object 162 is used for a printer class and a FAX class in the physical device object 152, for this, a device control object is Java of both a printer and FAX. It is because it is what supports SPI. The device control object loaded first is Java of a printer class. If only SPI is supported and the FAX class is not supported, the device control object which newly supports both searches and comes to hand, or the support of a FAX class is stopped. If coexistence is impossible, suppose that priority is given to the class loaded first.

[0266] Now, when logical device classification generally increases, it is inefficient-like in respect of use of resources, such as memory, to prepare beforehand all the logic device-class objects that may be used. Moreover, when one physical unit may be used from many logic device-class objects and a low order device control program (device control object of this operation gestalt) is changed depending on a high order logic device-class object, the procedure of determining a high order logical device according to a physical device becomes complicated. Especially, he is IEEE. By bus which is introduced into a home like 1394 buses and used also as a domestic network, it is difficult to limit the device connected beforehand.

[0267] It is appropriate in the above-mentioned network for a user to determine the high order logical device rather specified according to a user's use gestalt, and to use the connected equipment by the approach. For this reason, with this operation gestalt, by preparing an unknown device class, the usage has recognized strange equipment for the time being, and the approach of newly adding the high order logical device set by equipment so that it might mention later in detail is taken.

[0268] The 1394 management object 121 has the table of the class name corresponding to two or more logical devices and attribute value, and in case a physical device object performs 2nd initialization, the identifier and attribute value of two logic device-class objects may be specified, and you may ask the 1394 management object 121.

[0269] Next, initialization of the unknown logic device-class object 134 is explained.

[0270] The unknown logic device-class object 134 receives the reference to the 1394 management object 121 to a generate time like the logic device-class object 134 to 131-133. And the reference to each physical device object of 151, --, 156 is obtained like initialization of the logic device-class objects 131-133.

[0271] The unknown logic device-class object 134 obtains the reference to the physical device object 151 first. The unknown logic device-class object 134 asks the physical device object 151

whether have the reference to a logical device object, if it has, will stop recognition of the physical device object 151, and will receive the reference to the following physical device object 152. Since each is registered into other logical device objects, the physical device object 151,152,153 does not perform registration as an unknown device.

[0272] On the other hand, the physical device object 154 does not have the reference from a logical device object. The unknown logic device-class object 134 generates the logical device object 134-1 corresponding to the physical device object 154, and registers it into self here. The logical device object 134-1 registers the physical device object 154 into self. The unknown logical device object 134-1 does not require initialization of the physical device object 154. Therefore, a device control object is not registered into the physical device object 154 at this time.

[0273] Initialization with the same said of the physical device object 155,156 is performed hereafter, the unknown logical device object 134-2,134-3 is generated, the notice of completion is published, and initialization of an unknown device class is completed.

[0274] The logical device management object 122 will be ended if generation initialization of the logic device-class object defined beforehand and generation initialization of the unknown logic device-class object following it are completed. If initialization finishes, the logical device management object 122 can reply to a device-class list demand from application. Before initialization is completed, the answer of use impossible is returned to the inquiry from application.

[0275] Next, use of the device from application is explained. Here, taking the case of the case where a printer 90 is used, it explains from application.

[0276] In addition, it is Java about the interface between a physical device and a logical device. It is Java about between SPI, a logical device, and applications. It is referred to as API. In these, APIs between OS and Java differ.

[0277] The application program shall know the reference to the logical device object 131-1 corresponding to a printer 90 by predetermined approaches, such as an inquiry to OS.

[0278] For example, application knows beforehand the reference to the logical device management object 122, gains the reference to a printer class through the logical device management object 122, and receives the reference to a printer 131-1 from a printer class. Or the naming service about an equipment configuration may be offered.

[0279] An application program publishes a printing demand to the logical device object 131-1 by making reference to a postscript file into an argument.

[0280] The logical device object 131-1 gets to know that it is a postscript file from the header information of a file, and develops a postscript file to a bitmapped image. And the logical device object 131-1 publishes a printing demand to the physical device object 151 by making reference to an object including information, such as paper size assignment of those other than a bitmapped image and a bit map, into an argument. In addition, it is desirable to perform queue processing by the logical device object 131-1.

[0281] The physical device object 151 transmits the bit map information corresponding to a printing image to a printer 90 through the device control object 161. That is, the flag which PC81 uses for the CSR register A with which the printer 90 was defined beforehand by the lock transaction is written in. If it succeeds in lock and the royalty of a printer is acquired, next, a setup of the Isochronous channel on the IEEE1394 bus for transmitting data and the transaction which sets up printers, such as paper size and tray information, will be published. If a channel is gained, bit map information will be transmitted and a transfer will be completed, the transaction of the completion of a transfer will be published and the printing directions to a printer will be completed. Since the printing situation in a printer is displayed on a certain CSR register, completion of printing is got to know when a physical device object polls it.

[0282] Next, use of the equipment registered as an unknown type is explained taking the case of message equipment 12.

[0283] Software structure when drawing 27 adds a logic device-class object, an example of the

new device-class addition demand procedure according [ drawing 28 ] to application, and drawing 29 show an example of the new device-class addition procedure by the logical device management object 122, respectively.

[0284] Application publishes the list acquisition demand of logic device class to the logical device management object 122 (step S51). Acquisition of the reference to the unknown logic device-class object 134 requires list acquisition of a logical device of the unknown device class 134 (steps S52 and S53).

[0285] Application chooses the reference to the logical device object 134-1 corresponding to message equipment 92 from a list, and requires available logical device information (step S54).

[0286] The logical device object 134-1 acquires the attribute value from the physical device object 154, and publishes the retrieval demand of logic device class with the available physical device object 154 to the logical device management object 122. The logical device management object 122 has the table to which a logic device-class name is made to correspond from attribute value like previous statement. A logic device-class name or its list is returned to a logical device 134-1 from this table, and a logical device 134-1 acquires a logic device-class name to a demand, and notifies it to application as logical device information. Of course, it does not matter even if it carries out by asking the server on a network retrieval of a device-class name also here. It is desirable to store explanation by the object code of the default driver of message equipment and the natural language of directions in the storing location of a driver object at least.

[0287] Application chooses the logic device-class name "message equipment" to be used, and publishes a logic device-class registration demand to the logical device management object 122 (steps S55, S56, and S57).

[0288] The logical device management object 122 generates the new logic device-class object 135 corresponding to the specified class name (step S61), and inserts it between the unknown logic device-class object 134 and an unknown class, and the logic device-class object 133 of FAX linked (step S62). And the logical device object 134-1,134-2 registered into an unknown device class until now is deleted (step S63), and an initialization demand is published to the logic device-class object 135 (step S64). This condition is shown in drawing 27 . The procedure of future step S65 and step S66 and the initialization procedure of the new logic device-class object 125 are the same as that of what was already explained. In addition, 135-1 is the newly generated logical device object among drawing 27 .

[0289] Here, although the example which searches the logical device corresponding to an unknown device was explained, a new corresponding logical device may be searched from the combination of the existing physical device. For example, it is a case so that available new logical device FAX may be searched with the combination of each physical device with the function of a printer, a scanner, and a modem.

[0290] By having the above-mentioned function, the unnecessary program for controlling the device which is not used usually is not read at the time of initialization of a system, but by reading, when needed, can save resources, such as memory of PC, and can reduce cost.

[0291] Next, the configuration change event of 1394 devices is explained.

[0292] The connection situation of 1394 equipments that PC can be used may change. And by IEEE1394 bus, a configuration can be changed by the insert and remove of a connector working. This modification result must be reflected in a logical device as an addition and deletion of a device object. Moreover, if occupancy of the device by a certain equipment is completed, the device will become available with other equipments. Below, the procedure of recognizing change of such a configuration is explained.

[0293] Generating of bus reset notifies bus reset to the 1394 management object 121 from 1394 interfaces of OS. Again, the 1394 management object 121 acquires a list of 1394 physical units from TOPOLOGY\_MAP and SPEED\_MAP, and is those unique(s). ID is acquired and correspondence with a known device is taken.

[0294] First, the 1394 management object 121 makes "unknown" exist attribute value of all physical device objects after bus reset.

[0295] unique acquired from equipment unique which the physical device object of existing [ ID ] holds When in agreement with ID, the equipment is registered and already considers exist as "existence."

[0296] unique acquired from equipment unique which the physical device object of existing [ ID ] holds When not in agreement with ID, the equipment is equipment added newly, carries out generation initialization of the physical device object, and considers exist as "existence."

[0297] They are all NODE(s) about this actuation. After following ID, the physical device object to which exist is unknown deletes it as that from which corresponding equipment was removed. If a physical device object is deleted, it is notified to a corresponding logical device object, and after a logical device object performs a post process and notifies it to a corresponding device class, it will eliminate self.

[0298] If correction of reference by an addition and deletion is completed, the 1394 management object 121 will notify modification of a configuration to the logical device management object 122. A notice will not be performed if there is no change in a configuration.

[0299] The logical device management object 122 which received the notice publishes a configuration change demand to each device class.

[0300] The printer class 131 which received the configuration change demand requires reference of a physical device of the logical device object 122 like initialization. It differs from initialization that only the physical device object newly added in the configuration change is applicable to all the physical device objects having been objects in initialization. Each logic device class reads the attribute of the physical device added newly, and if it judges whether it is in agreement with a self-class and is in agreement, it will generate and register a corresponding logical device object.

[0301] Completion of the configuration change of all classes registers the physical device object which initialization of an unknown class was performed and was not registered as which logical device with the added device into an unknown class.

[0302] Next, modification of an occupancy condition is explained.

[0303] In initialization, to the equipment which was judged to be in the occupancy condition by other nodes, and was excepted from recognition, the 1394 management object 121 performs periodic polling, and detects modification of a device occupancy condition by the readout of a register. The device which changed into the condition of not occupying is registered in the same procedure as change of the device configuration described by bus reset. If the PC concerned occupies said equipment exclusively, the value which shows it to the register in which the occupancy condition of equipment is shown for it will be written in.

[0304] Next, the case where a local logical device object is old is explained.

[0305] In such a case, the logic device-class object has the attribute of a version number. Application can publish the updating demand of a logic device-class object to the logical device management object 122. While the logical device management object 122 acquires the version number of the logic device-class object as which updating was required, it requires the newest version number of the archive server of the logic device-class object specified beforehand. If the version number of a local logic device-class object is in agreement with the newest thing and the version number of a local logic device-class object is young, the newest device class will be read from an archive server, and an object will be generated. This logic device-class object does not operate at this time.

[0306] If it succeeds in generation of an object, the notice of termination will be published to the existing logical device, and actuation will be terminated. If it is a printer, reception of a new print job will be stopped and it will wait for termination of the print job under activation. Completion of an active job and a post process notifies completion to the logical device management object 122. The logical device management object 122 sends the notice of initiation of a logical device to a logic

device-class object, after it changes the reference relation which an old logical device has and a new logical device object succeeds reference relation. The logic device-class object which received the notice starts actuation.

[0307] (3rd operation gestalt) The case where the remote IEEE1394 equipment to which PC (thing with the function of the 2nd operation gestalt) connected to the network was connected via networks other than IEEE1394 is controlled by this operation gestalt is explained.

[0308] The example of the structure of a system which starts this operation gestalt at drawing 30 is shown. 401, 411, and 434 express PC in the 1st home 451, network connection equipment, and a toaster, respectively. 402, 412, 431, 432, and 433 express PC in the 2nd home 452, network connection equipment, a printer, FAX, and message equipment, respectively. In addition, each component other than the network connection equipment in drawing 30 is the same as that of that to which it corresponds in drawing 1.

[0309] It shall be connected with the ISDN communication line 413 between LAN in a home 451, and LAN in a home 452. Termination of the communication line 413 is carried out with network connection equipment 411,412.

[0310] In LAN in a home 451, 1394 buses 421 connect between the contact 411, PC401, and the toaster 434.

[0311] In LAN in a home 452, 1394 buses 422 connect between a contact 412, PC402, a printer 431, a scanner 432, and message equipment 433.

[0312] A network shall be the Internet using Internet Protocol and only PC401,402 and the contact 411,412 shall have an IP address beforehand. Although what was assigned fixed was assigned by protocols, such as DHCP and PPP, whichever is sufficient as an IP address.

[0313] Here, PC401 at a home 451 tries connection with the device of a home 452. PC401 sends the character string which shows a home 452 to network connection equipment 411 by Internet Protocol, for example, a connection request including "Yoshiaki Takahata" who is the name. And network connection equipment 411 has the database with which the telephone number of the home 452 corresponding to "Yoshiaki Takahata" is searched, and makes connection with the contact 412 of a home 452.

[0314] A contact 412 performs authentication of a connecting agency before connection. Connection shall not be made if a permission is not granted at an authentication step. Suppose authentication that the connection of those other than the telephone number registered beforehand at the 2nd home 452 is not accepted for example, using a dispatch telephone number display. If connection is completed, the communication link by Internet Protocol can be performed between homes 451,452.

[0315] However, even if connection is completed from a viewpoint of security protection, it is desirable to operate as the so-called fire wall a contact judges good/failure of passage of a packet to be by the plan of the home. Here, it shall be set up so that all packets may pass beforehand between a home 451 and a home 452 and all actuation can be performed.

[0316] In addition, this connection may be not connection but the IP connection by the telephone.

[0317] Now, PC401 at a home 451 acquires the address of a service management server from the database of a contact 411. The address shall be beforehand registered into the contact 411. Next, PC401 asks a service management server available service. Here, network connection equipment 412 shall serve as a service management server.

[0318] A service management server answers an inquiry and returns the service in the network concerned, and the information on the server. Here, the next service is registered.

[0319] printer:pc2Java The train of ORB:pc2 left expresses the multiplexing identifier (for example, port number) assigned to service the classification of service, and here, and a right train expresses the IP address of PC402 the whereabouts of service, and here. Such a service information offer means is known as a service location protocol in the Internet (for example, reference "Internet draft draft-ietf-svrloc-protocol-16.txt").



[0320] These are registered into the host who offers service, and the network connection equipment 412 with which PC402 was beforehand defined here at the time of starting.

[0321] printer expresses the printing service defined by the Internet criterion, and the UDP/TCP number of 515 is assigned. The protocol used here is beforehand prescribed by the Internet criterion.

[0322] Java ORB expresses the service which can use a Java object from the outside. Such service is Java here, although not specified as a criterion yet now. There shall be agreement beforehand about the port number showing ORB.

[0323] Next, how to use through the approach approach 2 1394 proxy object used through the network service standardized by the approach [ two kinds of ] and approach 1 Internet using 1394 equipments of RIMOTO is explained.

[0324] By the approach 1, the printer 431 connected to PC402 by the IEEE1394 interface is used by printer service standardized as Internet Protocol. PC401 has the client of a printer protocol and delivery and a printer are used for PC402 for a printing demand of the format which specified the logic name showing a printer 431 and was standardized in the Internet format. The element of device dependence is not contained in the message which transmits a network by this approach. The application of PC401 only specifies and requires the identifier of the equipment corresponding to printer service and a printer 431, and he is not conscious of the property of equipment.

[0325] Roughly, an approach 2 uses the format that the packet of an IEEE1394 format was encapsulated by the IP packet for the message which transmits a network. PC401 can be used as if the printer 431 was connected to 1394 local buses.

[0326] Hereafter, it explains in more detail about the above-mentioned approach 2.

[0327] The software structure of the service via a network before connection of a client side is shown in drawing 31, the software structure of the service via a network after connection of a client side is shown in drawing 32, the software structure of the service via a network before the connection by the side of a proxy is shown in drawing 33, and the software structure of the service via a network after the connection by the side of a proxy is shown in drawing 34. In addition, each component other than IP function in drawing 31 - drawing 34 has the same function as that to which it corresponds in drawing 2. The IP functions 504 are many functions of a series of Internet Protocol (TCP/IP protocol sheet), such as TCP/UDP/IP.

[0328] Drawing 31 is the software configuration of the client PC 401 before 1394 stub object generation. The function manager of each hard disk with which a logical device function manager and 502 have in a secondary storage function manager, and 501 has 511,512 to the subordinate of 502, 1394 interface management functions and 513,514. 503 Each 1394 interface-management function, unit1,521 in 504 IP function and 434 indicate a toaster and 509 indicates toaster ability to be A 1394 management object, 522 corresponds to a logical device management object, and 531,532,533,534 corresponds to a printer, a scanner, message equipment, and each unknown logic device-class object. 534-1 is the logical device object of an unknown class. 551 expresses the physical device object corresponding to a toaster 434. 561 expresses the driver object (control program) corresponding to the physical device object 551.

[0329] Drawing 32 is the software configuration of the client PC 401 after 1394 stub object generation, and the 1394 stub object 571, the logical device object 533-1,533-2, the physical device object 551, and the driver object 562,563 are added to the configuration of drawing 31.

[0330] Drawing 33 is a software configuration by the side of [ PC / 402 ] a proxy before 1394 proxy object generation, in each 1394 interface-management function and 431, a printer and 432 express FAX and 433 expresses [ the function manager of each hard disk with which a logical device function manager and 602 have in a secondary storage function manager, and 601 has 611,612 to the subordinate of 602, and 603 / 1394 interface management functions and 613,614 ] message equipment, respectively. A 1394 management object and 622 621 A logical device management object, The logic device-class object corresponding to a printer, a scanner, FAX, and

each unknown device class in 631,632,633,634, 651 and 652,653,654,655, respectively unit1 of a printer (604 in drawing), unit1 (605 in drawing) and unit2 of FAX (606 in drawing), unit1 of message equipment (607 in drawing). The physical device object corresponding to unit2 (608 in drawing) and 631-1,631-2,632-1,633-1,634-1,634-2 are logical devices which the subordinate of logic device class has, respectively. 661,662,663 expresses the driver object corresponding to the physical device object 651,652,653, respectively.

[0331] Drawing 34 is a software configuration by the side of [ PC / 402 ] a proxy after 1394 proxy object generation, the 1394 proxy object 681, the logic device-class object 635, and the logical device object 635-1,635-2 are added to the configuration of drawing 33, and the logical device object 634-1,634-2 is deleted.

[0332] PC401 specifies the IP address of PC402 of RIMOTO based on service information, and generates the 1394 stub object 571. A 1394 stub object is Java of PC402 of RIMOTO. The class name assigned to the 1394 proxy object is specified as an ORB port, and the generation is required.

[0333] A certain host to another host's Java When using ORB, it judges whether the security manager of a receiving side allows the connection. This shall be automatically performed by the use demand of ORB by the object of a transmitting side.

[0334] Here, the ORB use demand from PC401 should be received with PC402, in PC402, the 1394 proxy object 681 is generated as a demand, and the reference is returned to the 1394 stub object of PC402. The 1394 stub object 571 performs future demands through the 1394 proxy object 681. In addition, ORB which can use only the method which generates the 1394 proxy object 571 beforehand before PC's402 requiring, and can be started from the object concerned may be assigned to the port considered as 1394 services. This is effective to offer the service limited to 1394.

[0335] If reference is received, the 1394 proxy object 681 will gain the reference to the physical device corresponding to the logical device of an unknown class, and will notify it to the 1394 stub object 571.

[0336] If above reference is gained, the 1394 stub object 571 will register the 1394 management object itself into the 1394 management object 522, and will publish the demand which reconfigures 1394 devices.

[0337] By this demand, the 1394 management object 522 starts reconstruction by the 1394 proxy object 681, and requires the reference to a physical device object. A 1394 stub object passes the reference 654,655 to the physical object gained from 571 and the 1394 proxy object 681 in order to the 1394 management object 521. Taking out attribute value from here, the 1394 management object 521 creates the physical device object 552,553 in the same procedure as the case of initialization explained with the 2nd operation gestalt. However, the physical device object (it is hereafter called a stub device object) created here holds the reference to a remote \*\*\*\*\* physical device object, and it differs in a local physical device object in that the I/O processed as a transaction request to 1394 interfaces is processed as I/O between the 1394 stub objects 571 by the stub device object (in addition, the detail is mentioned later).

[0338] Next, initialization of the logic device-class object 533 by the logical device management object 522 and initialization of the logical device object following it are performed. The stub object 552,553 corresponds to the physical device object 654,655, and agrees in message device class. In PC402 of RIMOTO, since message device class is not used, these equipments are recognized as unknown equipment, but since message device class is registered in local PC401, it is registered as a logical device object 533-1,533-2.

[0339] If an initialization demand is given to the stub object 552 from the logical device object 533-1, the use demand of the physical device object 654 corresponding to the 1394 proxy object 681 of RIMOTO will be published.

[0340] The 1394 proxy object 681 of RIMOTO generates and registers the logic device-class

object 635 of a proxy class. The logical device object 634-1 corresponding to the physical device object 654 is eliminated, the device of a proxy class is built, and it registers as a proxy logical device object 635-1.

[0341] If the proxy logical device object 635-1 is generated, a port number will be assigned between the stub objects 533-1, and a logic connection will be generated. The port used here is Java. ORB is for transmitting 1394 packets using another port.

[0342] A control program is read, the stub object 552 side of local PC401 operates, the physical device object of PC401 of RIMOTO outputs the packet inputted from the port to 1394 interfaces, the packet inputted from 1394 interfaces is only transmitted to a port, and the control program 562 of the stub object 552 performs state control of equipment. However, events, such as bus reset, transmit.

[0343] The same is said of the case where an initialization demand is given to the stub object 553 from the logical device object 533-2.

[0344] The made environment where the physical device of RIMOTO can be used from a local logical device is ready with the above procedure.

[0345] Next, actuation is explained. Here, it explains taking the case of the physical device object 552 of a stub.

[0346] The physical device object 552 receives a processing demand from the logic device driver 531-1, and generates the packet of 1394 formats corresponding to it. The packet of 1394 formats is encapsulated by the IP packet and outputted to said logic connection who secured.

[0347] Here, the direct output of the output from the physical device object 552 is processed through the IP function 504 from a logic connection rather than it is carried out to the IEEE1394 interface 503.

[0348] Here, this may be Ethernet and ATM although the point of the IP function 504 is processed by the IEEE1394 interface. That is, PC without an IEEE1394 interface can also control as if IEEE1394 equipment was connected locally.

[0349] Now, proxy logical device OBUJIEKU 635-1 is reached, the packet of 1394 formats is taken out, and the packet encapsulated by the IP packet is passed to the physical device object 654. Physical device OBUJIEKU 654 outputs this to 1394 interfaces as it is, and acts on the register of equipment 433.

[0350] I/O of the isochronous channel of IEEE1394 cannot be relayed by the above-mentioned approach. An isochronous channel is set up by operating a register by the method defined by IEC 1883 in IEEE1394.

[0351] The setting demand of IEC1883 published by self-equipment from the stub object 552 is transmitted 1394 stub object 571, and the 1394 stub object 571 sets up the connection on the Internet corresponding to an isochronous channel.

[0352] The band to secure can be specified by the isochronous channel of IEEE1394. Since the information is included in the above-mentioned setting demand, it is desirable to specify a connection's band with a means, for example, means, such as RSVP, to secure a band on the Internet.

[0353] In addition, although connected with this operation gestalt by the ISDN communication line 413 between LAN in a home 451, and LAN in a home 452 Connection between LAN in a home 451 and LAN in a home 452 is made the Internet like the 1st operation gestalt. In this case, may make it use a global IP address for the IP address of a terminal, and For example, address translation, such as NAT (Network Address Translation), is used. When a public network 2 is the Internet, a global IP address is used for the node ( drawing 1 AV contact terminal) which interconnects a network at least, and you may enable it to use a private IP address for other nodes.

[0354] In addition, each above function is realizable also as software. Moreover, it can also carry out as a medium which recorded the program for making a computer perform each above-mentioned procedure or the above-mentioned means and in which machine read is possible.

[0355] This invention is not limited to the gestalt of operation mentioned above, in the technical range, can deform variously and can be carried out.

[0356] The service provision equipment with which it held in the 2nd home network to the 1st AV contact 4 with the 1st operation gestalt as shown in drawing 12 (4th operation gestalt) (For example, the WWW server, the digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10) The case where a service location protocol was used although the information (it is hereafter called service information simply) about the service which a printer 11 offers is notified was shown.

[0357] The 4th operation gestalt explains the case where this is performed with a WWW (World Wide Web) server using a homepage.

[0358] The example of a system configuration in the 4th operation gestalt is the same as that of drawing 1. Here, it considers performing remote control of the various service provision equipments in the 2nd domestic network (printers 11, such as a WWW server, a digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10) from the 1st AV contact 4 of the 1st domestic network like the 1st operation gestalt.

[0359] Drawing 35 is the thing in the 4th operation gestalt which showed the example of an internal configuration of the 2nd AV contact 5, actuation of each part of 1394 I/F1401, the data link switch 1402, public network I/F1403, the IP processing facility 1404, the FANP processing facility 1405, and the 1394AV command-processing function 1408 is the same as that of the same function part of drawing 2, and a different point is explained. That is, the service location processing facility 27 of drawing 2, and 1394 / IP command conversion function 29 are transposed to the homepage processing facility 1407 and the HTTP/RTSP processing facility 1409 by drawing 35, respectively.

[0360] The 1394/IP service location processing facility 1406 has the function which notifies service information outside if needed, when it has recognized what kind of service the service which the service provision equipment connected to the IEEE1394 bus offers like the 1st operation gestalt is searched, or the registration is received, and what kind of service provision equipment exists on 1394 buses, and is offered and it is required. Moreover, it notifies to the homepage processing facility 1407 which mentions later the service information for every service provision equipment obtained by doing in this way, and creation of the homepage which displays the situation of the 2nd domestic network is urged.

[0361] The homepage processing facility 1407 has WWW server ability. From the 1394-/IP service location processing facility 1406, reception and it are summarized for the service information on the 2nd domestic network as a homepage. For example, the icon and character string showing each service provision equipment are arranged on a homepage. And it is made to link to the icon and character string showing each service provision equipment on the homepage corresponding to each for the command for carrying out remote control of each service provision equipment. Thus, when the created homepage has access through a public network 2, the homepage demanded if needed is transmitted or the command for remote control received through the public network 2 is transmitted to the HTTP/RTSP processing facility 1409. It mentions later for details.

[0362] Here, with the command for carrying out remote control of the service provision equipment, it is suitable for HTTP or RTSP (protocol for operating the real-time media in a WWW server by remote control). The command for remote control which was suitable for the HTTP command and RTSP in the command for remote control suitable for HTTP is called the RTSP command.

[0363] The HTTP/RTSP processing facility 1409 has the HTTP demon or the RTSP demon inside. With the function to perform processing to the HTTP command or the RTSP command transmitted from the homepage processing facility 1407 In being what is assigned to the service which the 2nd AV contact 5 serves as a substitute, and the destination of the command exhibits It is changed into an IEEE1394 command if needed, and it also has the function (substitute processing) which controls the device on 1394 buses 3 through the 1394AV command-processing function 1408.

[0364] Next, in the 2nd domestic network, the procedure which acquires the service information on

each service provision equipment that the 2nd AV contact 5 was connected to the 2nd domestic network is explained. This is the same as that of the 1st operation gestalt. That is, as shown in drawing 3 , the 2nd AV contact 5 is with reading the configuration memory of the connected device (the DVD player 8, digital VTR 9, PC10, printer 11), and using a service location protocol, as shown in drawing 9 , and acquires the service information on the service provision equipment connected to the 2nd domestic network.

[0365] In addition, the information included in configuration memory may have drawing 4 , drawing 5 , and a thing like drawing 6 . Moreover, service information may be registered in the format shown in drawing 10 .

[0366] Now, the 2nd AV contact 5 recognizes the DVD player 8, digital VTR 9, PC10, and a printer 11 as 1394 nodes through reading of configuration memory at this time. Moreover, each of WWW service, digital album service, Aircon Service, and microwave oven service is further recognized through a service location protocol. Here, it is recognized as it being the service which is provided with the 2nd AV contact 5 and provided with Aircon Service and microwave oven service with PC10.

[0367] Now, the 2nd AV contact 5 creates the homepage "introduces what there is in that house (what kind of service [ what kind of service provision equipment and ] exist?)" based on these collected service information.

[0368] The homepage created enumerates icons, character strings, etc. showing them for every service provision [ to make it recognize / a user ] equipment, as shown in drawing 36 R> 6. This homepage may build this so that it can reach by the hyperlink from an icon in a saying in the first homepage which the WWW server of that house introduces by the default, for example (for example, "the electrical machinery and apparatus of my home") character string. Incidentally, in case it moves to the homepage of this "electrical machinery and apparatus of my home", passing through a certain authentication procedure is desirable so that it may not be invaded by others who have not got authorization.

[0369] When the icon in a homepage as shown in drawing 36 , and a character string are clicked, it is made for the service provision equipment corresponding to it or the homepage for every service to appear. For example, you may make it a click of the icon of the DVD player of drawing 36 display "the homepage of a DVD player" as shown in drawing 39 linked to it.

[0370] In order to create a homepage as shown in drawing 36 of such a configuration, the homepage processing facility 1407 completes a procedure as shown in the flow chart of drawing 37 .

[0371] First, it reads one [ at a time ] the service information registered into 1394 / IP service location processing facility 1406 for example, for every service provision equipment, and the homepage (for example, "homepage of a DVD player" as shown in drawing 39 ) for every service provision equipment is created (step S101 – step S102).

[0372] The flow chart shown in drawing 38 shows the homepage creation procedure for every service provision equipment of step S102.

[0373] With reference to the table 1410 (refer to drawing 50 ) corresponding to a RTSP command for every service provision equipment provided in 1394 / IP service location processing facility 1406, the command group (command group for control of the service provision equipment which lets a homepage pass and is opened to a user) as which each service provision equipment was determined beforehand is acquired (step S111), and the icon or character string corresponding to it is created for every command (step S112). For example, when service provision equipment is a DVD player, the RTSP command "PLAY" for directing "playback" is acquired from the table corresponding to a RTSP command of drawing 50 R> 0, and the icon (icon i206 of drawing 39 ) corresponding to the command is created.

[0374] As for the table 1410 corresponding to a RTSP command, the RTSP command is described for every service provision equipment. For example, in the case of the DVD player 8, as a command

group, each RTSP command of power-source ON, power-source OFF, playback, rewinding, front music, a rapid traverse, the following music, a halt, and a halt is mentioned. Moreover, the case of the DVD player 8 which is performing substitute processing with the 2nd AV contact 5, and digital VTR 9 is having both 1394 commands corresponding to each RTSP command memorized as shown in drawing 50.

[0375] In addition, the table 1410 corresponding to a RTSP command may be the same as the table provided in 1394 / IP command conversion function 1423 of drawing 42 mentioned later.

[0376] Now, the RTSP command of the service provision equipment is matched with the icon or character string created at step S112 (step S113). For example, the RTSP command "PLAY" is made to correspond to the icon i206 of "playback" of drawing 39. For example, an icon or a character string, and the RTSP command corresponding to it may be registered into a table.

[0377] in addition, the case of the DVD player 8 which is performing substitute processing with the 2nd AV contact 5, and digital VTR 9 -- the address of the 2nd AV contact 5, the DVD player 8, and digital VTR 9 -- the port number assigned to each IEEE1394 node is included in the RTSP command.

[0378] The homepage of service provision equipment as performed the above to all the commands that the service provision equipment offers, and arranged the created icon or character string suitably, for example, shown in drawing 39 is created (step S114 - step S115).

[0379] Next, the icon or character string of the service provision equipment with the hyperlink to the homepage for every service provision equipment created by explanation of drawing 37 according to the flow chart of return and drawing 38 is created or acquired (step S103). That is, the icon for every service provision equipment etc. may be taken out from the configuration memory of that service provision equipment, and may come to hand in the form which goes for URL which can be specified as a meaning to be offered by the service location protocol, and to take the location of this icon with it there.

[0380] The icon obtained at step S103 is stuck on the homepage of "the electrical machinery and apparatus of my home." It holds in the 2nd domestic network, the above procedure is performed about the service provision equipment of all \*\*\*\*\*, and a homepage like drawing 36 can create it (step S104).

[0381] Now, if it clicks on the icon i101 which expresses a DVD player among the icon showing the service provision equipment on the homepage shown in drawing 36, or a character string, the homepage of the service provision equipment matched with this icon, i.e., the homepage of a DVD player as shown in drawing 39, will appear.

[0382] The homepage of a DVD player can be used as a control panel of a DVD player in the homepage of service provision equipment as shown in drawing 39, i.e., this case, and a user can do remote control of the DVD player 8. For example, when a "power-source ON" carbon button is clicked, it is condition that the power source of the DVD player 8 is turned on.

[0383] Next, it explains with reference to the sequence diagram showing the processing actuation in the case of carrying out remote control of the various service provision equipments in the 2nd domestic network (printers 11, such as a WWW server, a digital album server function, etc. in which it provided in the DVD player 8, digital VTR 9, and PC10), through the 1st AV contact 4 and a public network 2 from PC6 of the 1st domestic network in drawing 4040, for example.

[0384] Suppose that the homepage as shown in drawing 36 was shown by using a predetermined WWW browser with PC6 held in the 1st domestic network. The HTTP message as which he will demand the homepage of the DVD player by which the correspondence price was carried out to it if a user clicks on the icon of the DVD player i101 is outputted from PC6.

[0385] In response to this message, the sending-out demand of the homepage of DVD is performed to the 2nd AV contact 5 with the 1st AV contact 4 (step S4501). For example, the message "GET/appliances/dvd.html HTTP/1.1" is transmitted to the 2nd AV contact 5 from the 1st AV contact 4.

[0386] In response, the 2nd AV contact 5 sends the text (refer to drawing 41 ) of the homepage of a DVD player as shown by drawing 39 to the 1st AV contact 4 (step S4502).

[0387] As shown in drawing 41 , the hyperlink given to the "reproductive" icon i206 is the "PLAY" command of RTSP for directing playback, and the node used as the connection place, in the case of this operation gestalt the IP address of the 2nd AV contact 5, i.e., "192.168.1.254", and its port number (in the case of this operation gestalt "2000") are added. If it clicks on the "reproductive" icon i206 by doing in this way, a user can send out the "PLAY" command of RTSP to the port of a request of a desired node, without caring about the address of a transmission place. It can have and remote control using RTSP can be performed now through correlation of a hyperlink.

[0388] Now, the user of 1st AV contact can start remote operation of a DVD player, if the homepage of DVD is received. For example, suppose that it clicked on the icon i201 of the "power source ON" of the homepage of drawing 39 (step S4503). For example, the "SETUP" command of RTSP is matched with the icon i201 of "a power source ON" by the hyperlink. Therefore, "SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport : It is with rtp/udp;port=5500" and command data are transmitted to the 2nd contact 5 from the 1st AV contact 4 (step S4504). With this command data, the 1st AV control device 4 transmitted data using each protocol of RTP/UDP, and is requiring that the port number of a receiving side should use "5500."

[0389] Actuation of the 2nd AV contact 5 which received this is explained below. The example of an internal configuration of HTTP / RTSP processing facility 1409 of 2nd AV contact is shown in drawing 42 . The "SETUP" command data of Above RTSP reach the HTTP/RTSP main processing facility 1421. Here, first, among "SETUP" command data, it recognizes that a port number "2000" is a port number currently assigned to the DVD player 8 which is 1394 nodes, and control is passed to the RTSP redundancy 1422.

[0390] With reference to the table in the 1394-/IP command conversion function 1423, the RTSP redundancy 1422 finds a corresponding 1394 AV/C command (AV/C command which means power-source ON in the case of this operation gestalt), and publishes the above-mentioned AV/C command through the 1394AV command-processing function 1408 to 1394 corresponding nodes (in the case of this operation gestalt DVD player 8) (step S4505).

[0391] If it succeeds in this, the 2nd AV contact 5 sends out "O.K." command data (for example, "RTSP/1.0 200 1 - Session: 1234") of RTSP which means the completion of control to the 1st AV contact 4 (step S4506). In that case, the session number (in the case of this operation gestalt "1234") is added to the RTSP command as a number of a meaning through this session. The browser of the 1st AV contact 4 adds a session number "1234" to a command, when holding this session number and publishing the RTSP command to the same equipment below.

[0392] Next, a user presupposes that it clicked on the icon i206 of "playback" of the homepage of drawing 39 (step S4507). For example, the "PLAY" command of RTSP is matched with the "reproductive" icon i206 by the hyperlink. Therefore, the command data "PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234" are transmitted from the 1st AV contact 4 to the 2nd AV contact 5 (an IP address "192.168.1.254", a port number "2000", session number "1234") matched by this hyperlink (step S4508).

[0393] It executes the "PLAY" command to reservation (step S4509) of the synchronous channel by IEC1883, and the DVD player 8 of a 1394 AV/C protocol in order to urge playback of the DVD player 8 to the 2nd AV contact 5 which received this (step S4510), and sending out to the synchronous channel in which image data carried out [ above-mentioned ] reservation is urged to it. And when the "ACK" signal of the purport which transmitting preparation of image data completed is received from the DVD player 8, the 2nd AV contact 5 transmits "O.K." command data ("RTSP/1.0 200 2 - Session:1234") of RTSP to the 1st AV contact 4 (step S4511 - step S4512).

[0394] Then, the 2nd AV contact 5 carries out IP capsulation of the image data sent through this synchronous channel, and sends them out to the 1st AV contact 4 as an IP packet (step S 4513-



4515).

[0395] The 1st AV contact 4 receives the above-mentioned image data as an IP packet, and performs required processings, such as a display of an image. When making the sending-out place of an image digital [ TV / 7 ] Reservation of the required synchronous channel on IEEE1394 which is the 1st domestic network, and the 1st AV contact 4 receive digital [ 7 ] one TV like the 1st operation gestalt. What is necessary is just to send out to the 1st domestic network, after taking out the above-mentioned image data from a receiving IP packet after directing a display on the screen of the data reception and its data from this synchronous channel, and changing into the format for IEEE1394.

[0396] In addition, even when the user clicks on the "reproductive" icon i206 before clicking on the icon i201 of the "power source ON" of the homepage of drawing 39, the user judges that there is volition of actuation of the DVD player 8, and sends out both the "SETUP" command and the "PLAY" command in response to the click of the "reproductive" icon i206.

[0397] Moreover, when opening the homepage of a DVD player, the "SETUP" command of a DVD player is sent out as a RTSP command.

[0398] It is based on the service information collected from all the service provision equipments in which remote control held in the 2nd domestic network is possible as explained above. The 2nd AV contact 5 With reference to the table 1410 corresponding to a RTSP command, the RTSP command of each service provision equipment and the homepage which carries the linked icon are created. When it clicks on a desired icon by the 1st AV contact 4 side which accessed this homepage, The RTSP (it registers with table of 1394-/IP command conversion function 1423 of HTTP/RTSP processing facility 1409) command matched with the icon by the hyperlink By being changed into 1394AV(s) / C-command, and performing desired control to desired service provision equipment Remote control will become possible even when the service provision equipment (for example, DVD player 8) connected to the 2nd physical network (for example, IEEE1394 bus 3) can interpret only the protocol depending on a data link layer (if AV contact of this invention is used).

[0399] Now, the above explained the case where the 2nd AV contact 5 encapsulated and sent out image data to an IP packet. On the other hand, the 2nd AV contact 5 does not perform IP capsulation, but how to send out image data to the 1st AV contact 4 with non-IP data is also considered. In this case, it explains with reference to the sequence which is attached and is shown in drawing 43.

[0400] The user of the 1st AV contact 4 of step S4801 - step S4802 is the same as that of explanation of drawing 40 until he begins remote operation of reception and a DVD player for the homepage of a DVD player.

[0401] For example, suppose that it clicked on the icon i201 of the "power source ON" of the homepage of drawing 39 (step S4803). For example, the "SETUP" command of RTSP is matched with the icon i201 of "a power source ON" by the hyperlink. Therefore, "SETUP rtsp://192.168.1.254:2000 RTSP/1.0 1 Transport : The "SETUP" command data of RTSP called iec1883 / nonip;port=FANP" are transmitted to the 2nd contact 5 from the 1st AV contact 4 (step S4804). It is being required that the 1st AV control device 4 should encapsulate data in IEC1883, and should transmit them with this command data in the form which is not an IP packet (the information of "iec1883/nonip" for directing non-IP packet-ization is included in [SETUP [ namely, ]" command of RTSP). Moreover, in order to know the link layer information and attribute information on the data transmitted, it is being required from the 2nd AV contact 5 that the above-mentioned information should be notified to the 1st AV contact 4 using FANP.

[0402] The "SETUP" command data of RTSP are received by the HTTP/RTSP processing facility 1409 of the 2nd AV contact 5, and reach the HTTP/RTSP main processing facility 1421.

[0403] In the HTTP/RTSP main processing facility 1421, it recognizes that a port number "2000" is a number currently assigned to the DVD player 8 which is 1394 nodes, and control is passed to the RTSP redundancy 1422.

[0404] With reference to the table in the 1394-/IP command conversion function 1423, the RTSP redundancy 1422 finds a corresponding 1394 AV/C command (AV/C command which means power-source ON in the case of this operation gestalt), and publishes the above-mentioned AV/C command through the 1394AV command-processing function 1408 to 1394 corresponding nodes (in the case of this operation gestalt DVD player 8) (step S4805).

[0405] If it succeeds in this, the 2nd AV contact 5 sends out "O.K." command data (for example, "RTSP/1.0 200 1 - Session: 1234") of RTSP which means the completion of control to the 1st AV contact 4 (step S4806). In that case, the session number (in the case of this operation gestalt "1234") is added to the RTSP command as a number of a meaning through this session. The browser of the 1st AV contact 4 adds a session number "1234" to a command, when holding this session number and publishing the RTSP command to the same equipment below. The session number which a browser holds is updated by reference of the hyperlink corresponding to termination of the explicit session by the user, for example, session termination, termination of the session by the 2nd AV contact 5 by the side of opposite, or reloading of a page.

[0406] Next, a user presupposes that it clicked on the icon i206 of "playback" of the homepage of drawing 39 (step S4807). For example, the "PLAY" command of RTSP is matched with the "reproductive" icon i206 by the hyperlink. Therefore, the command data "PLAY rtsp://192.168.1.254:2000 RTSP/1.0 2 Session:1234" are transmitted from the 1st AV contact 4 to the 2nd AV contact 5 (an IP address "192.168.1.254", a port number "2000", session number "1234") matched by this hyperlink (step S4808).

[0407] It executes the "PLAY" command to reservation (#X) of the synchronous channel by IEC1883, and the DVD player of a 1394 AV/C protocol in order to urge playback of the DVD player 8 to the 2nd AV contact 5 which received this, and sending out to the synchronous channel in which image data carried out [ above-mentioned ] reservation is urged to it (steps S4809-S4811). And when the "ACK" signal of the purport which transmitting preparation of image data completed is received from the DVD player 8, the 2nd AV contact 5 transmits "O.K." command data ("RTSP/1.0 200 2 - Session: 1234") of RTSP to the 1st AV contact 4 (step S4811 - step S4812).

[0408] Then, IP capsulation does not perform the image data sent through this synchronous channel (#X), but the 2nd AV contact 5 encapsulates a public network as it is, and sends it out to the 1st AV contact 4. For example, as long as a public network is an ATM network, IEC1883 packet transmitted to the 2nd AV contact 5 may be mapped and sent out to an ATM network as it is, IEC1883 packet may be removed once, and the image data itself may be mapped and sent out to an ATM network. make it any -- in order to notify the header information of the link layer which the 2nd AV contact 5 sends out to the 1st AV contact 4, a FANP message "FANP message (ch: #y, Session:1234)" is sent out (step S4813).

[0409] In order to clarify that how to use a FANP message is FANP corresponding to the session number notified in step S4812 although it is the same as that of the 1st operation gestalt fundamentally, the session number (in the case of this operation gestalt "1234") of the same value as the value notified at step S4812 may be contained in this FANP message. By making it this appearance, the receiving-side node 4, i.e., 1st AV contact, can recognize that a FANP message is a thing corresponding to the "PLAY" command of said RTSP.

[0410] Now, if the image data sent by the synchronous channel (#X) from the DVD player 8 are outputted to a public network 2 in the 2nd AV contact 5, without carrying out IP capsulation, required processings, such as a display of an image, will be performed in the 1st AV contact 4 which received it (steps S4814-S4816). As it is in step S4815 in that case, MPEGover1394 to MPEGoverATM etc. may perform required format conversion, when the data transmission approach depending on the network transmitted is specified. Moreover, when making the sending-out place of an image digital [ TV / 7 ], it is also the same as that of the above-mentioned case.

[0411] Although the above operation gestalt [ 4th ] has explained the case where the RTSP command for carrying out remote control of the service provision equipment to the icon or

character string in a homepage is made to correspond in a hyperlink To the icon in the homepage corresponding to each RTSP command, or each of a character string, instead of making it correspond in a hyperlink When the program (for example, JAVA (trademark) program) for creating corresponding RTSP command data is stuck and the icon or character string is clicked The RTSP command which starts this program with the 1st AV contact 4 (for example, JAVA virtual machine on the 1st AV contact 4), and was explained by drawing 40 or drawing 43 is sent out.

[0412] The processing actuation in this case is the same as that of drawing 40 and drawing 43 , and text description of the homepage of the service provision equipment transmitted from the 2nd AV contact 5 at step S4504 of drawing 40 and step S4802 of drawing 43 differs.

[0413] An example of the text of the homepage of service provision equipment is shown in drawing 44 . The program which is the text of the homepage of a DVD player, for example, generates the RTSP command to the icon i206 of "playback" of drawing 39 is added to drawing 44 .

[0414] Too, if it clicks on the "reproductive" icon i206 also in this case, by starting the program which generates the "PLAY" command of RTSP, that command can be sent out now to the port of a request of a desired node, it can have it in it, and remote control of the service provision equipment using RTSP can be carried out.

[0415] Next, the icon (carbon button) i210 of "a detail setup" of the homepage of drawing 39 is explained. This carbon button is used to perform actuation finer than remote control beforehand defined by the RTSP command to target service provision equipment (for example, DVD player 8). That is, the control command of the DVD player 8 specified with the AV/C protocol of IEEE1394 may be various from the command specified by RTSP. Thus, if the homepage which performs this is separately set up as a cure in the case of the ability to respond to no commands of 1394 AV/C by the RTSP command and the carbon button of "a detail setup" of drawing 39 is pushed, it was matched with it, for example, the command "GET /appliances/dvd\_detail.html HTTP/1.1" will be sent out and the homepage for a detail setup of a DVD player as shown in drawing 47 will be sent.

[0416] Drawing 45 shows the creation procedure of the homepage for a detail setup of service provision equipment. That is, the table corresponding to the native command which registered the command (native command) depending on the link layer method (AV/C protocol of IEEE1394 when it is this operation gestalt) of the service provision equipment on which correspondence is not made on the command table 1410 for every above-mentioned service provision equipment is separately provided in 1394 / IP service location processing facility 1406. With reference to a native command table, a native command is acquired for every service provision equipment (step S121), and the icon or character string corresponding to it is created for every command (step S122). A CGI (Common Gateway Interface) script is matched with the generated icon or character string (step S123). The homepage for a detail setup of service provision equipment as performed the above to all the native commands of the service provision equipment, and arranged the created icon or character string suitably, for example, shown in drawing 47 is created (step S124 - step S125).

[0417] In addition, the table corresponding to a native command may be the same as the table in the CGI processing facility 1424 provided in the HTTP/RTSP processing facility shown in drawing 42 .

[0418] Some carbon buttons (an icon or character string) arranged at the homepage for a detail setup of the DVD player of drawing 47 are matched with the CGI script processed by the CGI (Common Gateway Interface) processing facility in the 2nd AV contact 5. And each CGI script is the script which sends out AV/C-command of corresponding IEEE1394 to the IEEE1394 bus of the 2nd domestic network, and it has, and if the above-mentioned icon or a character string is clicked, grain size defined with the AV/C protocol can be controlled.

[0419] Thus, if the homepage for a detail setup is created and the icon or character string in the homepage is clicked, the demand message for starting the CGI script in the 2nd AV contact 5 which swerved, and was been and matched is transmitted in HTTP, in response to it, with the 2nd

AV contact 5, this CGI script will be started and a corresponding AV/C command will be published. [0420] the thing to which drawing 46 is transmitted from the 2nd AV contact 5 and which showed an example of text description of the homepage for a detail setup of a DVD player, for example -- it is -- the character string of "slow playback" of drawing 47 -- a CGI script -- correspondence -- the price -- the \*\*\*\*\* case is shown.

[0421] Although the RTSP command will be published like step S4508 of the above-mentioned drawing 4040 if it chooses "usually reproducing" by the homepage for a detail setup of the DVD player of drawing 47 About the command which is not supported by RTSP, such as "language selection" and "slow playback" In the CGI processing facility 1424 provided in the HTTP/RTSP processing facility of the 2nd AV contact 5, the corresponding CGI script is started and a corresponding AV/C command is published through the 1394AV command-processing function 1408.

[0422] For example, when "slow playback" is chosen by the homepage shown in drawing 47 , the message "dvd/slowplay.cgi HTTP [ GET http://192.168.1.254/]/1.1" for starting the CGI script corresponding to this is turned and sent out to the 2nd AV contact 5. In the 2nd AV contact 5 which received this, since the command of "slow playback" is not supported by RTSP, in the CGI processing facility 1424 provided in a HTTP/RTSP processing facility, the corresponding CGI script is started and a corresponding AV/C command is published through the 1394AV command-processing function 1408.

[0423] It is easy to be natural, even if the icon or character string corresponding to the RTSP command, and the icon or character string corresponding to a CGI script may be intermingled in the homepage for a detail setup of service provision equipment and the homepage consists of only the icons or character strings corresponding to a CGI script. For example, "playback" carbon button of drawing 47 , the carbon button of "a power source ON" and "a power source OFF", etc. may be realized by a JAVA program etc. in the hyperlink about the command in the table corresponding to a RTSP command, and you may realize in CGI about other detail commands, such as "selection language" and a "title."

[0424] moreover, all the carbon buttons arranged at the homepage for a detail setup of drawing 47 are registered into the table corresponding to a native command -- having -- \*\*\*\* -- a CGI script -- correspondence -- the price -- \*\*\*\*\* -- it is good.

[0425] As mentioned above, although the 4th operation gestalt has described remote control of the AV equipment according to the AV/C command on an IEEE1394 bus, same control can be similarly performed about the device which has a protocol group depending on the link layer of other arbitration. The case where LON which is a kind of a home automation network is applied as the example is explained.

[0426] Drawing 48 and drawing 49 show the example of an internal configuration of AV contact which connects LON, respectively, and the example of a configuration of a HTTP/RTSP processing facility.

[0427] the point which can send out now command groups, such as the command group defined by LON, for example, LONTalk etc., instead of the AV/C command of IEEE1394 -- difference -- it is a point and each other configuration sections are the same as that of the above-mentioned.

[0428] In addition, each function explained with the 4th operation gestalt above is realizable also as software. Moreover, it can also carry out as a medium which recorded the program for making a computer perform each above-mentioned procedure or the above-mentioned means and in which machine read is possible.

[0429] This invention is not limited to the gestalt of operation mentioned above, in the technical range, can deform variously and can be carried out.

[0430] (5th operation gestalt) Drawing 51 is what showed the example of a configuration of the communication system concerning the 5th operation gestalt of this invention, and the 1st network (for example, home network which consists of IEEE1394 buses) 2010 and 2nd network (for example,

Internet on a public network 2101) interconnect through the AV contact 2201. Hereafter, the 1st network 2010 is called a home network 2010, and the 2nd network 2101 is called the Internet 2101. Moreover, each terminal unit connected to the home network 2010 presupposes that it is an information appliance with the Internet processing facility.

[0431] The AV contact 2201 has the role of the Gateway which connects a home network 2010 and the Internet 2101, and it has the termination function of a home network or the Internet, router ability, a protocol conversion function, substitute server ability, etc. so that it may mention later.

[0432] The personal computer (PC) 2001, the printer 2002, and the DVD player 2003 are connected to the IEEE1394 bus which constitutes a home network 2010. The IP terminal 2102 which can perform IP communication link is connected to the Internet 2101. Of course, terminal units other than the above may be connected to a home network 2010 and the Internet 2101.

[0433] In drawing 51, all terminal units are terminal units which can have an Internet terminal, i.e., an IP address, and can perform IP communication link. However, the IEEE1394 bus which constitutes a home network 2010 is employed in the address of private IP address space, and the Internet 2102 is employed in global IP address (for example, IPv4) space. The IP address of the IP terminal 2101 presupposes that it is "G. 2." On the other hand, as the address of each equipment on a home network 2010, it has the private subnet address "P. 0", and PC2001 presupposes that "P. 1" and a printer 2002 are [ "P. 2" and the DVD player 2003 ] "P. 3."

[0434] Since it connects with these [ from which an address system differs ] two networks, the AV contact 2201 has the address of two different address systems. That is, the IP address by the side of a home network 2010 presupposes that the IP address by the side of the Internet 2101 is "G. 1" by "P. 254."

[0435] Drawing 52 shows the example of a configuration of the AV contact 2201. The AV contact 2201 A home network 2010 The Internet interface 2205 which manages the interface for accessing 1394 interfaces (I/F) 2202 and the Internet 2101 which manage the interface for connecting with the IEEE1394 bus to constitute (I/F), The service in IP processing section 2202 which performs routing processing of the Internet packet, address translation between a global IP address and a private IP address, etc., and a home network 2010 is detected. The equipment on the service location substitute processing section 2203 which collects and presents these services through the homepage processing section 2204 to the Internet 2101 side (advertisement), and a home network 2010, About service, the homepage which can perform remote control from the Internet 2101 side is generated, and it consists of the homepage processing sections 2204 which deliver this according to a demand.

[0436] IP processing section 2202 possesses the NAT processing section 2206 which performs address translation processing. NAT is the abbreviation for network address translation (translation), and, generally transform processing between a global IP address and a private IP address or transform processing of the IPv4 address and the IPv6 address is performed. For details, please refer to RFC1631.

[0437] The NAT processing section 2206 also has the address translation function of the port unit called an IP masquerade. Namely, even if many terminal units are in a home network 2010 side It is the technique which will be made enough if there is one global IP address (G. "1" when it is this operation gestalt) required for the Internet 2101 side. Specifically Each terminal unit connected to the home network 2101, As opposed to the logic multiplex identifier (the logic multiplex identifier of the service identified in the port number specified by RFC1340 is a port number) of each service (for example, service identified in the port number specified by RFC1340) Other separate logic multiplex identifiers (for example, port number specified by RFC1340) are assigned for every service with the same global IP address "G. 1." It memorizes as a table (address port number translation table 2207) as shows these correspondence relation to drawing 55. And the communication link of the terminal unit on the Internet 2101 and the equipment on a home network 2010 is mutually attained by changing into the address and the port number of a mutual address

space the destination address of the packet transmitted to another side from either the Internet 2101 and the home network 2010 using this table 2207, and being transmitted.

[0438] IP processing section 2202 possesses a packet filter 2208 further. A packet filter 2208 has a function as the so-called firewall. That is, as the packet (or packet which may pass) which should pass the AV contact 2201 and which does not come out is distinguished and this is not passed to other parts other than IP processing section 2202 about the packet which should pass and which does not come out (for example, it discards), access to a home network 2010 from the outside is restricted. This prevents beforehand access to the service on the home network 2010 by the malicious user. For this decision processing, a packet filter 2208 has the table (packet filter table 2209) which passed the AV contact 2201 and registered the source address of the packet which can be sent out to a home network 2010, and when the source address of the packet inputted from the Internet 2101 is registered into this table, it permits that passage. In addition, the source address which does not pass the AV contact 2201 may be registered into the packet filter table 2209. In this case, if the source address of the packet inputted from the Internet 2101 is not registered into this table, it permits passage of that packet.

[0439] Next, the case where access a home network 2010, for example, the DVD player 2003 is operated by remote control from the IP terminal 2102 on the Internet 2101 with reference to the sequence shown in drawing 53 is taken for an example, and processing actuation of the AV contact 2201 is explained.

[0440] First, the service location substitute processing section 2203 of the AV contact 2201 collects the service location information on a home network 2010 (step S5001 – step S5003). Service location information is information which shows what kind of service or terminal unit exists on a home network 2010. Some approaches can be considered as an approach of collecting service location information. For example, although various approaches, such as an approach using a service location protocol, an approach using LDAP (lightweight directory access protocol), an approach using DHCP (dynamic host configuration protocol), and an approach using MIB (management information base) of SNMP (simple network-control protocol), can be considered, which these approaches may be used.

[0441] Here, the service location information on a home network 2010 shall be collected, for example using a service location protocol as shown in drawing 12. In addition, refer to RFC2165 for the detail of a service location protocol. Like drawing 53, the AV contact 2201 serves as a directory agent of a home network 2010, and collection of actual service location information may register each service to the AV contact 2201 from each service agent (namely, PC2001, a printer 2002, the DVD player 2003).

[0442] In addition, the AV contact 2201 sends out a service request to IP multicast address beforehand assigned to each service about the service which can support the AV contact 2201 besides such an approach, and you may make it the terminal unit itself which offers the service concerned answer to this demand. Moreover, you may make it ask the directory agent the AV contact 2210 recognizes [ an agent ] separate existence on a home network 2010 the detail of service on a home network 2010.

[0443] Based on the information (port number of the service specifically offered by the address and the equipment concerned of a terminal unit on a home network 2010 (RFC1340 prescribes)) about the service currently offered on the home network 2010 collected here, processing actuation as shown in the flow chart of drawing 54 is performed.

[0444] The AV contact 2201 creates the homepage explaining what kind of service and terminal unit exist in owner (for example, referred to as Mr. A) \*\* of a home network 2010 in the homepage processing section 2204 (step S5101 – step S5102).

[0445] This homepage is a homepage displayed to access URL (Uniform Resource Locator), "http://G.1", of A Mr. \*\* from the terminal unit of the arbitration on the Internet 2101 as shows drawing 59. [ i.e., ] It is the user interface which can operate each service which exists in A Mr. \*\*,

and a terminal unit by the CGI (Common Gate Way) program from this homepage, for example. If the link is stretched to each terminal unit on a home network 2010 and that object is clicked from this homepage in fact, next it connects with the homepage of each terminal unit, and has become the structure as which the homepage which becomes possible [ operating the actuation switch of that terminal unit which each terminal unit offers by remote control ] is displayed.

[0446] Next, the service location substitute processing section 2203 assigns the port number (well not a NOUN port number but the port number which can be set up dynamically) specified by the original logic multiplex identifier 1340, i.e., RFC, about each of the service collected previously or a terminal unit (step S5104). It sets from the first on a home network 2010, and a \*\*\*\*\* port number calls the port number to which it sets from the first on a home network 2010 and to which a \*\*\*\*\* port number is hereafter assigned uniquely in the service location substitute processing section 2203 to the service on the 1st port number, a call, and a home network 2010 the 2nd port number, in order to distinguish.

[0447] For example, the 2nd port number "2000" is assigned so that the 2nd port number "2002" may tell it a printer 2002 and the 2nd port number "2004" may tell PC2001 to the DVD player 2003. This 2nd port number becomes the global IP address and group of the AV contact 2201, and is employed. That is, from the Internet 2101 side, when the 2nd port number "2000" is accessed, this will interpret the AV contact 2201 as it being access to the DVD player 2003. In addition, if a logic multiplex identifier is an identifier which can identify on the Internet each service offered not only the port number specified by RFC1340 but on a home network 2010, it is good anything.

[0448] The correspondence relation between the global unique IP address of the AV contact 2201, the 2nd port number assigned to each service offered on a home network 2010, the 1st port number as a logic multiplex identifier to the service concerned on a home network 2010, and the private IP address of equipment which offers the service concerned is registered into the table 2207 corresponding to an address port number (step S5105).

[0449] The example of the table 2207 corresponding to an address port number is shown in drawing 55. The IP address by the side of the Internet 2101 (global unique IP address), the IP address by the side of the 2nd port number and a home network 2010 (private IP address), and the pair of the 1st port number are registered into the table 2207 corresponding to an address port number for each [ are provided on a home network 2010 ] the service of every. Sequential registration of the correspondence relation about all services with which this table 2207 is provided on a home network 2010 is carried out.

[0450] For example, in the case of the DVD player 2003, to the Internet 2101 side, the 2nd port number "2000" is assigned to service (IP address (private IP address) =P.3, the 1st port number = interpreted as it being the http service offered by the DVD player by 80 by the service location protocol) of the DVD player within a home network 2010 by the global IP address "G. 1" of the AV contact 2201.

[0451] Creation of such an address port number translation table 2207 is performed about each of service of A Mr. \*\*. About this each, description to the homepage of A Mr. \*\* is performed.

[0452] About all services of A Mr. \*\*, after the registration to a table 2207 finishes, creation of the address port number translation table 2207 and creation of the homepage of A Mr. \*\* are completed (step S5106).

[0453] Now, the created address port number translation table 2207 is used in case an IP packet passes through the inside of the AV contact 2201, and an IP address and transform processing of a port number are performed. With reference to drawing 58, transform processing of the IP address and port number using the address port number translation table 2207 is explained concretely. For example, by referring to a table 2207, an IP packet [ as / the Internet 2101 side to whose destination IP address is "G. 1" / whose destination port number is "2000" ] is changed into an IP packet [ as / whose destination IP address is "P. 3" / whose destination port number is "80" ], and is sent out to a home network 2010 side. On the contrary, a transmitting agency IP address is

changed into an IP packet [ as / "G. 1" and whose transmitting agency port number are "2000" ], and, as for an IP packet [ as / "P. 3" and whose transmitting agency port number are "80" ], a home network 110 side to a transmitting agency IP address is sent out to the Internet 2101.

[0454] Now, such an address port number translation table 2207 and the AV contact 2201 which ended creation of the homepage of A Mr. \*\* exhibit this homepage on the Internet 2101 as a homepage of A Mr. \*\* (refer to drawing 59 ).

[0455] Next, the user of the IP terminal 2102 on the Internet 2101 explains the case where the DVD player 2003 of A Mr. \*\* is operated by remote control.

[0456] Processing actuation of the AV contact 2201 at the time of receiving an IP packet for processing actuation of the AV contact 2210 at the time of receiving an IP packet from the Internet 2101 side from a home network 2010 side to drawing 56 is shown in drawing 57 . Hereafter, it explains with reference to the flow chart shown in drawing 53 , drawing 56 - drawing 57 .

[0457] First, the IP terminal 2102 performs authentication procedure in order to require sending of the homepage of A Mr. \*\* from the AV contact 2201 (step S5004 of drawing 53 ). For example, to the user of the IP terminal 2102, a password input etc. is required and the IP address of the IP terminal 2102 is registered into the above-mentioned packet filter table 2209 only about the user attested by this.

[0458] Access only of the IP address which the packet filter table 2209 is a table of only having only enumerated IP addresses, and is registered into this table to the service offered on a home network 2010 and a home network 2010 is attained.

[0459] Next, the IP terminal 2102 requires sending of the homepage of A Mr. \*\* from the AV contact 104 (step S5005). It checks (step S5006), when the source address concerned is registered into the packet filter table 2209, it restricts whether the source address of the packet of a sending demand of the homepage concerned is registered into the packet filter table 2209 by the packet filter 2208, and the packet concerned is passed to the homepage processing section 2204, and the homepage processing section 2204 sends the homepage of A Mr. \*\* to the IP terminal 2102 according to the demand concerned (step S5007).

[0460] As shown in drawing 59 R> 9, the link to each homepage of the DVD player 2003 on a home network 2010, a printer 2002, and PC2001 is attached to the homepage sent here. For example, it is linked to the alphabetic character or picture on the homepage of drawing 59 a "DVD player" to the DVD player 2003. The address of an actual link place serves as the 2nd port number "2000" of the global IP address "G. 1" of the AV contact 2201, and the format top serves as a substitute server for the AV contact 2201 to access to the equipment on a home network 2010. Of course, this is not recognized from the IP terminal 2102. However, the processing which the AV contact 2201 actually performs unlike substitute server processing is IP masquerade processing, i.e., an IP address and transform processing of a port number, like the after-mentioned.

[0461] Now, the user of the IP terminal 2102 sends out the sending-out demand of the homepage of a DVD player so that he may operate the DVD player 2003 by remote control. For example, the IP packet of a sending-out demand of the homepage of a DVD player is sent out by clicking the alphabetic character or picture on the homepage shown in drawing 59 a "DVD player." A destination IP address is [ "G. 1" and the destination port number of the destination of this packet ] "2000" (step S5008).

[0462] This IP packet is explained with reference to the flow chart shown in drawing 56 about packet filtering and address port number transform processing to the processing actuation S5009, i.e., the step of drawing 53 , when the AV contact 2201 receives - step S5010.

[0463] The AV contact 2201 will perform packet-filtering processing with reference to the packet filter table 2209 first, if it checks that it is addressing to itself with reference to the destination address of the IP packet which received (step S5201) (step S5202). If the source address of the packet concerned is registered into the packet filter table 2209 next, it will be confirmed whether the group of the destination IP address of the packet concerned and a destination port number is



registered into the address port number translation table 2207 (step S5203). If registered, according to the address port number translation table 2207, the destination IP address concerned and a destination port number are substituted for the IP address (private IP address) and the 1st port number by the side of a corresponding home network (step S5204), and the IP packet concerned is sent out to a home network 2010 (step S5205). Thus, address translation from a global IP address and the 2nd port number to a private address and the 1st port number is performed.

[0464] In addition, it does not register with the address port number translation table 2207, and the packet is discarded when it is not a packet addressed to AV contact 2201 itself (step S5206).

[0465] The IP packet which return and address port number transform processing (IP masquerade processing) were performed to explanation of drawing 53 , and was sent out to the home network 2010 side reaches the DVD player 2003 (step S5011), and the DVD player 2003 sends the homepage of the DVD player 2003 by making the global IP address of the IP terminal 2102 into a destination address. A private IP address "P. 3" and the transmitting agency port number of the transmitting agency IP address of the IP packet in that case are the 1st port number "80" (step S5012).

[0466] The IP packet containing the homepage of the DVD player 2003 is explained about processing actuation of the AV contact 2201 when receiving from a home network 2010 side, i.e., address port number transform-processing actuation of step S5013 of drawing 53 , with reference to the flow chart shown in drawing 57 .

[0467] The group of the transmitting agency address of the IP packet which received the AV contact 2201, and a port number confirms whether register with the address port number translation table 2207 (step S5301 – step S5302). If registered, after substituting the destination IP address concerned and a destination port number for the IP address (global unique IP address) and the 2nd port number by the side of the corresponding Internet according to the address port number translation table 2207 (step S5303), the IP packet concerned is sent out to the Internet 2101 (step S5304). In addition, in step S5303, when not registering with the address port number translation table 2207, the usual IP masquerade processing is performed (step S5305). That is, the group of a source address and a port number is newly registered into an address port number translation table, and it prepares for subsequent IP masquerade communication links.

[0468] The IP packet which return and address port number transform processing (IP masquerade processing) were performed to explanation of drawing 53 , and was sent out to the Internet 2101 side will reach the IP terminal 2102 (step S5014), the homepage of the DVD player 2003 will be displayed on the IP terminal 2102, and the user of the IP terminal 2102 will operate the DVD player 2003 by remote control using this screen.

[0469] Although this remote operation is performed between the IP terminal 2105 and the DVD player 2003 by exchanging a demand according initiation of playback actuation of for example, the DVD player 2003 etc. to a CGI program, and its processing result by the IP packet, though natural, IP masquerade processing like step S5010 of drawing 53 and step S5013 is performed in that case.

[0470] In the meantime, there is no recognition of 2102 IP terminal that he is communicating with the node (DVD player 2003 which specifically had a private IP address) of private address space. Thus, access to the service from global unique IP address space offered all over private IP address space is enabled by treating introduction and address translation processing (IP masquerade processing) of service as one.

[0471] In addition, in this operation gestalt, although address port number transform processing by the AV contact 2201 between the home networks 2010 which have private IP address space as the Internet 2101 and the 1st network which have global IP address space as the 2nd network has been explained, though natural, all of the following combination are possible for the 1st and 2nd networks.

[0472] (1) This invention is applicable also as the combination of a global IP address, the

combination (2) IPv four address with a private IP address, the combination (3) IPv6 address with the IPv6 address, and the link local IPv6 address, for example, the Internet employed in the IPv four address as the 2nd network, and the Internet employed in the IPv6 address as the 1st network.

[0473] Moreover, this invention can apply the 2nd network as it is also as the Internet employed in the IPv6 address, and the Internet employed in the link local IPv6 address as the 1st network.

[0474] Moreover, in the above-mentioned operation gestalt, as the approach of the advertisement service on a home network 2010 for the Internet 2102, although the approach using the homepage on the AV contact 2201 has been explained How to use LDAP (lightweight directory access protocol) as the approach of this service advertisement in addition to the above-mentioned approach, The approach using the configuration option of DHCP (dynamic host configuration protocol), Various approaches, such as an approach using the remote access of MIB (management information base) of SNMP (simple network-control protocol), can be considered. As the approach of this service advertisement, even if it uses which these approaches, it is easy to be natural.

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[Translation done.]

**\* NOTICES \***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] Drawing showing the example of 1 configuration of the network system concerning the 1st operation gestalt of this invention

[Drawing 2] Drawing showing the example of an internal configuration of AV contact concerning this operation gestalt

[Drawing 3] Drawing showing an example of the sequence of a terminal / service collection

[Drawing 4] Drawing showing an example of the contents described by Configuration ROM

[Drawing 5] Drawing showing other examples of the contents described by Configuration ROM

[Drawing 6] Drawing showing the example of further others of the contents described by Configuration ROM

[Drawing 7] Drawing showing the example of a screen in the case of performing the display according to service

[Drawing 8] Drawing showing the example of a screen in the case of performing the display according to terminal

[Drawing 9] Drawing showing an example of a procedure which registers service information to a directory agent

[Drawing 10] Drawing showing an example of the information registered into a directory agent

[Drawing 11] Drawing showing the example of a screen in the case of performing the display according to service

[Drawing 12] Drawing showing an example of the procedure which receives service information from a directory agent

[Drawing 13] Drawing showing an example of the information received by the directory agent

[Drawing 14] Drawing showing the example of a screen in the case of performing the display according to service

[Drawing 15] Drawing showing the example of a screen for DVD player actuation

[Drawing 16] Drawing showing an example of the sequence about the command group which flows the network top in the case of using the service on domestic [ 1st / LAN ] from on domestic [ 2nd / LAN ], and a protocol group

[Drawing 17] Drawing for explaining command conversion

[Drawing 18] Drawing showing other examples of the sequence about the command group which flows the network top in the case of using the service on domestic [ 1st / LAN ] from on domestic [ 2nd / LAN ], and a protocol group

[Drawing 19] Drawing showing other examples of the sequence about the command group which flows the network top in the case of controlling the equipment connected to domestic [ 1st / LAN ] from on domestic [ 2nd / LAN ], and a protocol group

[Drawing 20] Drawing for explaining command conversion

[Drawing 21] Drawing showing the example of 1 configuration of PC concerning the 2nd operation

gestalt of this invention

[Drawing 22] Drawing showing an example of the software configuration of the device driver concerning this operation gestalt

[Drawing 23] The flow chart which shows a logical device management object initialization procedure

[Drawing 24] The flow chart which shows a logic device-class object initialization procedure

[Drawing 25] The flow chart which shows a logical device object initialization procedure

[Drawing 26] The flow chart which shows a physical device object initialization procedure

[Drawing 27] Drawing for explaining the software structure at the time of using an unknown type

[Drawing 28] The flow chart which shows the new device-class addition demand procedure by application

[Drawing 29] The flow chart which shows the new device-class addition procedure by the logical device management object

[Drawing 30] Drawing showing the example of the network structure of a system which connected between domestic [ concerning the 3rd operation gestalt of this invention / LAN ]

[Drawing 31] Drawing showing the software structure of the service via a network before connection of a client side

[Drawing 32] Drawing showing the software structure of the service via a network after connection of a client side

[Drawing 33] Drawing showing the software structure of the service via a network before the connection by the side of a proxy

[Drawing 34] Drawing showing the software structure of the service via a network after the connection by the side of a proxy

[Drawing 35] Drawing having shown the example of a configuration of AV contact concerning the 4th operation gestalt of this invention

[Drawing 36] Drawing having shown the example of the homepage which presented the service provision equipment which is held in the 2nd domestic network, and in which all remote control is possible

[Drawing 37] The flow chart for explaining the creation procedure of a homepage as shown in drawing 36

[Drawing 38] The flow chart for explaining the creation procedure of the homepage of service provision equipment

[Drawing 39] Drawing having shown the example of the homepage of service provision equipment (DVD player)

[Drawing 40] The sequence diagram for explaining the processing actuation in the case of carrying out remote control of the service provision equipment held in the 2nd domestic network (when the icon and the RTSP command of a homepage are matched and IP capsulation of the transmit data is carried out further).

[Drawing 41] Drawing having shown one example of the text of the homepage transmitted.

[Drawing 42] Drawing having shown the example of a configuration of the HTTP/RTSP processing facility of AV contact

[Drawing 43] The sequence diagram for explaining the processing actuation in the case of carrying out remote control of the service provision equipment held in the 2nd domestic network (when the icon and the RTSP command of a homepage are matched and IP capsulation of the transmit data is not carried out further).

[Drawing 44] Drawing having shown other examples of the text of the homepage of service provision equipment (DVD player) (when the program which generates the RTSP command is added to the icon of "playback" of drawing 39 )

[Drawing 45] The flow chart which showed the creation procedure of the homepage for a detail setup of service provision equipment

[Drawing 46] Drawing having shown an example of text description of the homepage for a detail setup of service provision equipment (DVD player) (in the \*\*\*\*\* case [ The character string of "slow playback" of drawing 47 a CGI script correspondence the price ])

[Drawing 47] Drawing having shown the example of the homepage for a detail setup of service provision equipment (DVD player)

[Drawing 48] Drawing having shown the example of an internal configuration of AV contact which connects LON

[Drawing 49] Drawing having shown the example of a configuration of HTTP / RTSP processing facility of drawing 48

[Drawing 50] Drawing having shown one example of the table corresponding to a RTSP command

[Drawing 51] Drawing having shown the example of a configuration of the communication system concerning the 5th operation gestalt of this invention.

[Drawing 52] Drawing having shown the example of a configuration of AV contact of drawing 51 .

[Drawing 53] The sequence diagram of the whole communication system shown in drawing 51 in the case of accessing a home network from IP terminal on the Internet, and operating a DVD player by remote control.

[Drawing 54] The flow chart for explaining processing actuation of AV contact based on the information (port number of the service offered by the address and the equipment concerned of a terminal unit on a home network) about the service currently offered on the home network.

[Drawing 55] Drawing having shown the example of the table corresponding to an address port number.

[Drawing 56] The flow chart for explaining processing actuation of AV contact at the time of receiving an IP packet from the Internet side.

[Drawing 57] The flow chart for explaining processing actuation of AV contact at the time of receiving an IP packet from a home network side.

[Drawing 58] Drawing for explaining an IP address and transform processing of a port number concretely using an address port number translation table.

[Drawing 59] Drawing having shown an example of the homepage in \*\* created with AV contact.

[Description of Notations]

1 3 -- IEEE1394 bus

2 -- Public network

4 5 -- AV contact

6 10 -- PC

7 -- Digital TV

8 -- DVD player

9 -- Digital VTR

11 -- Printer

12 -- Home automation network

13 -- Air-conditioner

14 -- Microwave oven

21--1394 interface

22 -- Data link switch

23 -- Public network interface

24 -- IP processing facility

25 -- FANP processing facility

26--1394-/IP service location processing facility

27 -- Service location redundancy

28 -- 1394AV command-processing function

29--1394-/IP command conversion function

61 62 -- Table corresponding to a command

71 -- Service substitute reception function  
72 -- CCCP/LON command conversion function  
73 -- LON command issue function  
81,401,402 -- PC  
82 -- Processor  
83 -- Main memory  
84 -- System bus  
85 -- Secondary storage  
86 87 -- IEEE1394 interface  
88 -- Hard disk  
90,431 -- Printer  
91,432 -- FAX  
92,433 -- Massage equipment  
93,434 -- Toaster  
101, 501, 601 -- Logical device function manager  
102, 502, 602 -- Secondary storage tubing equipment \*\*\*\*\*  
103, 503, 603 -- 1394 interface management functions  
104 604 -- unit1 of a printer  
105 605 -- unit1 of FAX  
106 606 -- unit2 of FAX  
107 607 -- unit1 of massage equipment  
108 608 -- unit2 of massage equipment  
109 508 -- unit1 of a toaster  
111, 112, 511, 512, 611, 612 -- Hard disk function manager  
113, 114, 513, 514, 613, 614 -- Device driver of an IEEE1394 interface  
121, 521, 621 -- 1394 management object  
122, 522, 622 -- Logical device management object  
131-135, 531-534, 631-635 -- Logic device-class object  
131-1,131-2,132-1,133-1,134-1 to 134-3,135-1,533-1,533-2,534-1,631-1,631-2,632-1,633-1,634-1,634-2,635-1,635-2 -- Logical device object  
151-156, 551-153, 651-155 -- Physical device object  
161-166, 561-563, 661-665 -- Driver object  
411 412 -- Network connection equipment  
413 -- ISDN communication line  
421, 422--1394 bus  
504 -- IP function  
571 -- 1394 stub object  
681 -- 1394 proxy object  
1401 -- 1394 I/F  
1402 -- Data link switch  
1403 -- Public network I/F  
1404 -- IP processing facility  
1405 -- FANP processing facility  
1406--1394-/IP service location processing facility  
1407 -- Homepage processing facility  
1408 -- 1394AV command-processing function  
1409 -- HTTP / RTSP processing facility  
1410 -- Table corresponding to RTSP  
2001 -- Personal computer  
2002 -- Printer

2003 -- DVD player  
2010 -- The 1st network (home network)  
2101 -- The 2nd network (Internet)  
2102 -- IP terminal unit  
2201 -- AV contact

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[Translation done.]

## \* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

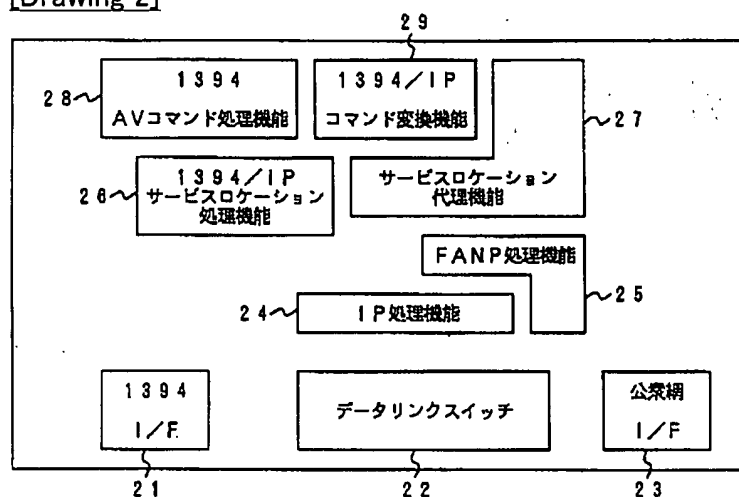
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

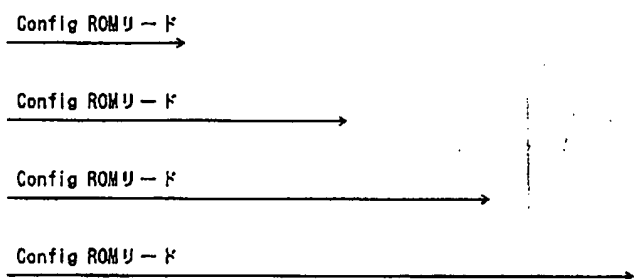
## DRAWINGS

[Drawing 2]



[Drawing 3]

第2の AV接続装置 5      DVD プレーヤ 8      デジタル VTR 9      PC 10      プリンタ 11



[Drawing 6]



ノード情報 (ペンダイド ノードケーパビリティ等)
ユニット情報 (PC, 又は1394PCIボード)

[Drawing 13]

URL: Service:DVD1394://192. 168. 1. 254:20000  
Attributes: 1394上のDVDの属性情報

URL: Service:DVTR1394://192. 168. 1. 254:20001  
Attributes: 1394上のデジタルVTRの属性情報

URL: Service:http://192. 168. 1. 1:80  
Attributes: WWWサービスの属性情報

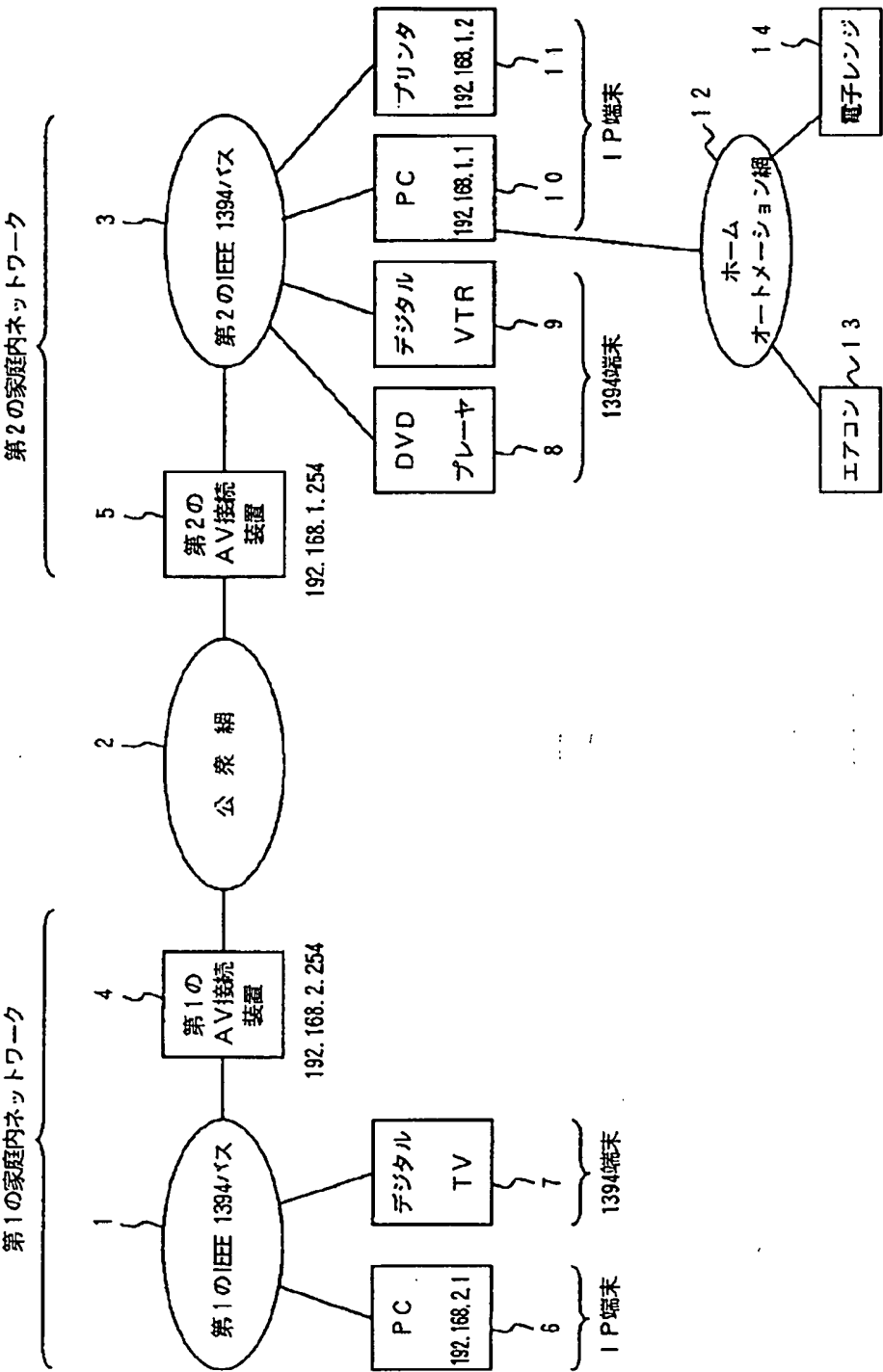
URL: Service:album://192. 168. 1. 1:900  
Attributes: デジタルアルバムサービスの属性情報

URL: Service:aircon\_lan://192. 168. 1. 1:15000  
Attributes: LAN上のエアコンの属性情報

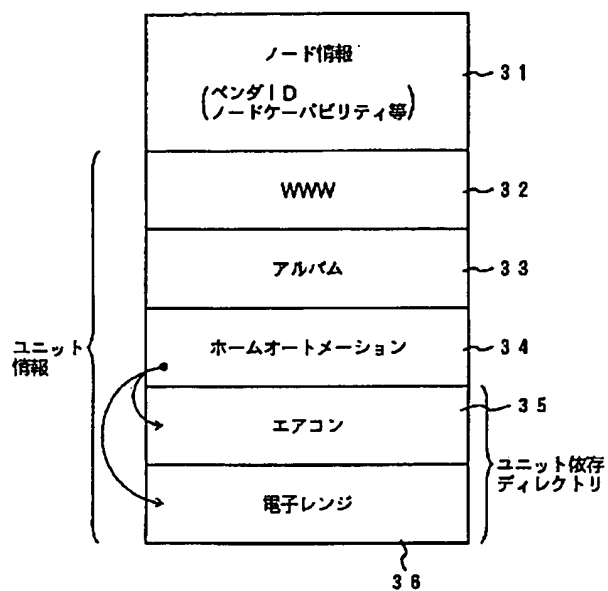
URL: Service:microwave\_lan://192. 168. 1. 1:15001  
Attributes: LAN上の電子レンジの属性情報

URL: Service:lpr://192. 168. 1. 2:515  
Attributes: lprサービス (プリンタサービス) の属性情報

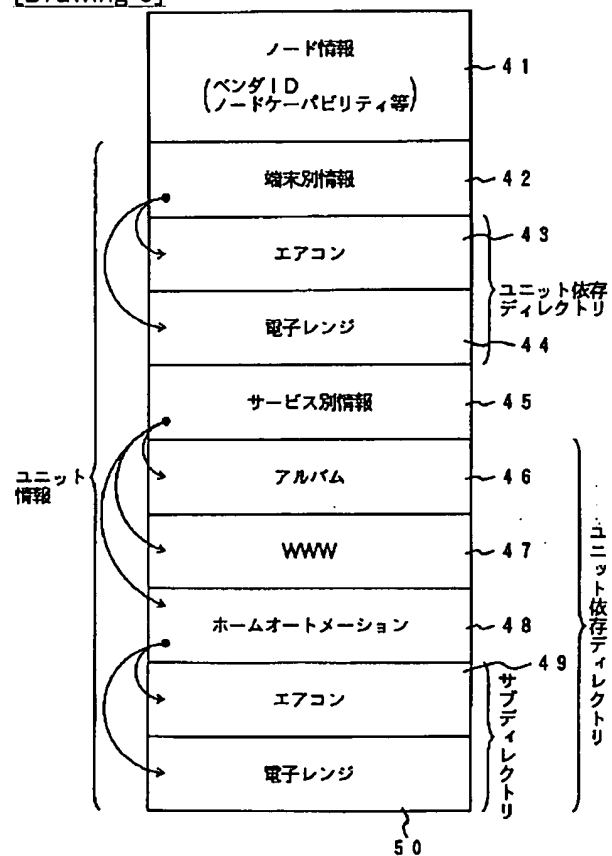
[Drawing 1]



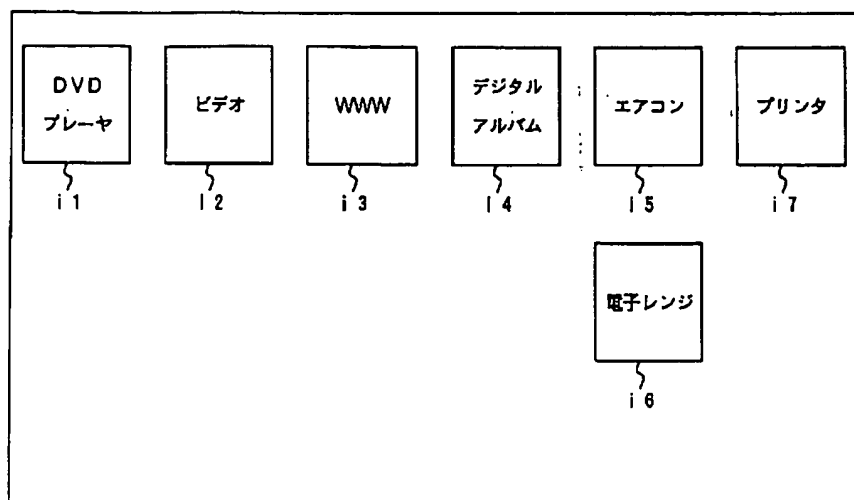
[Drawing 4]



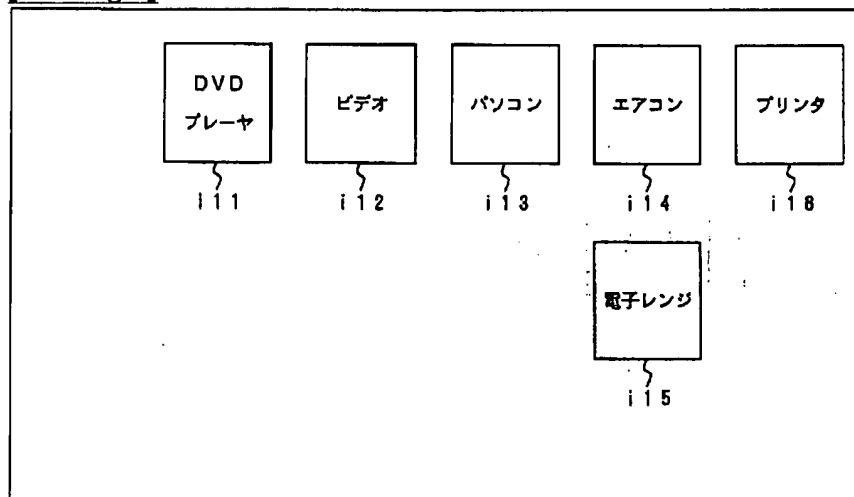
[Drawing 5]



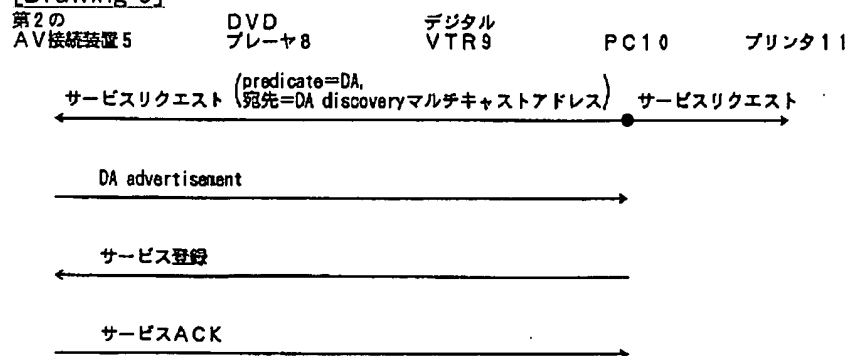
[Drawing 7]



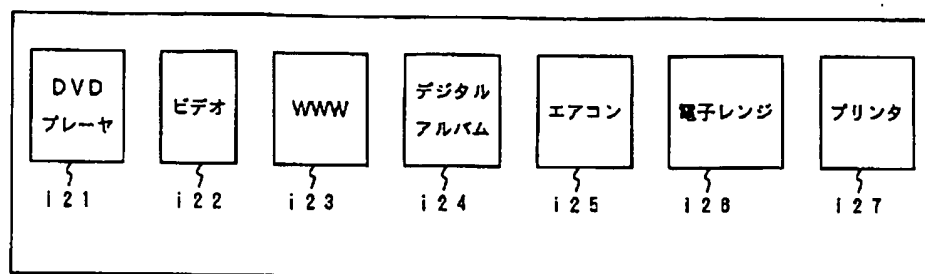
[Drawing 8]



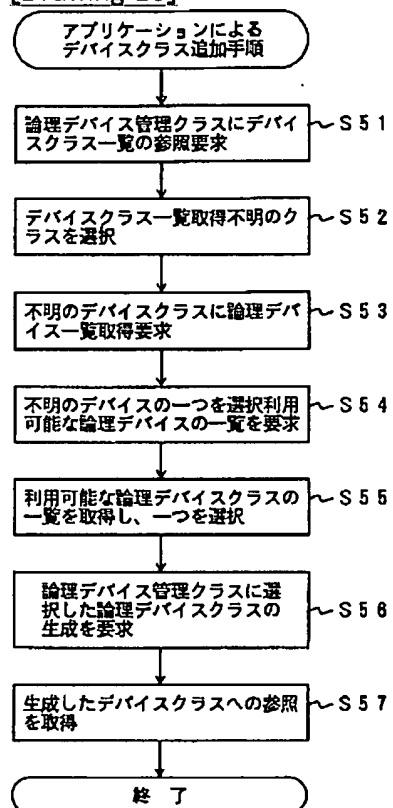
[Drawing 9]



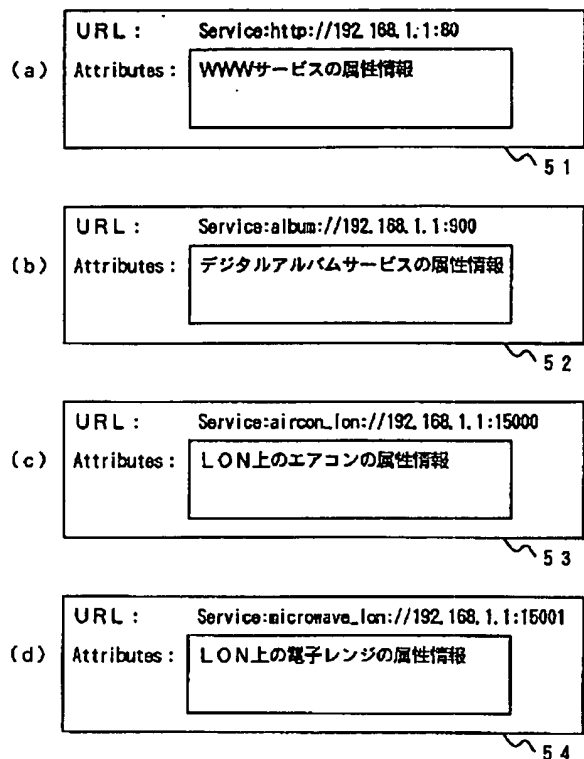
[Drawing 11]



[Drawing 28]



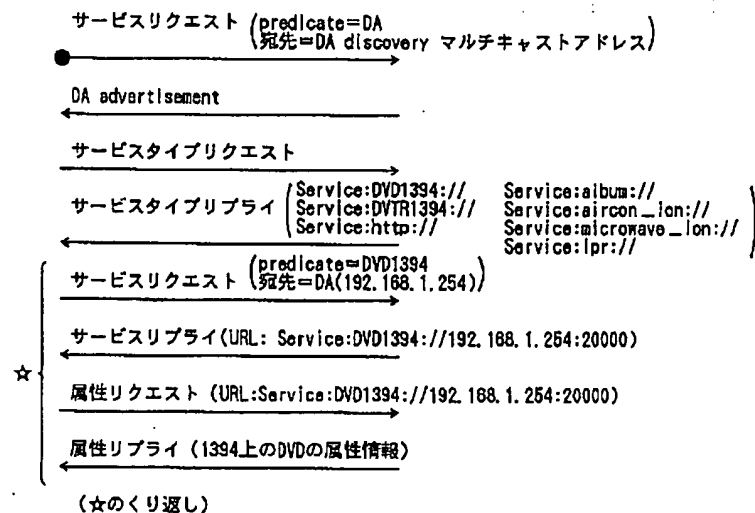
[Drawing 10]



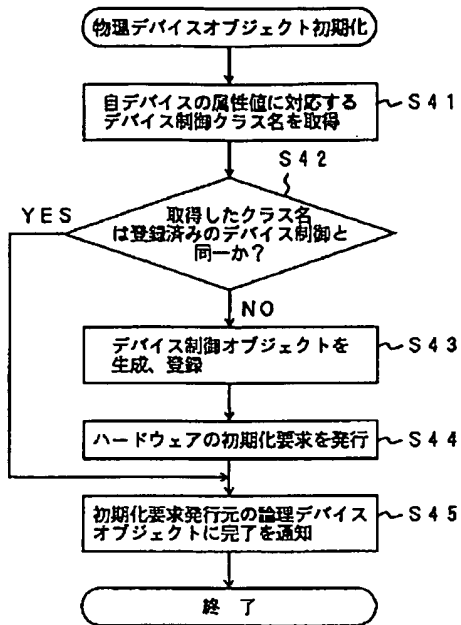
## [Drawing 12]

第1のAV接続装置 4

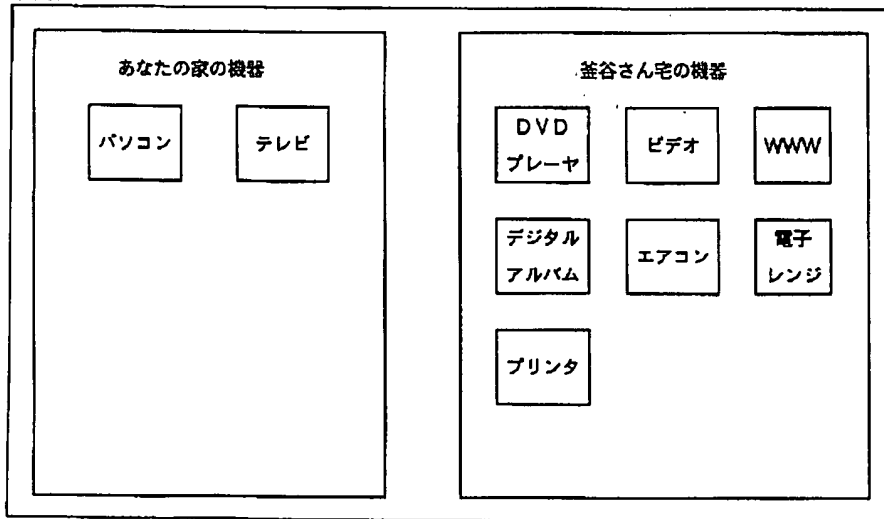
第2のAV接続装置 5



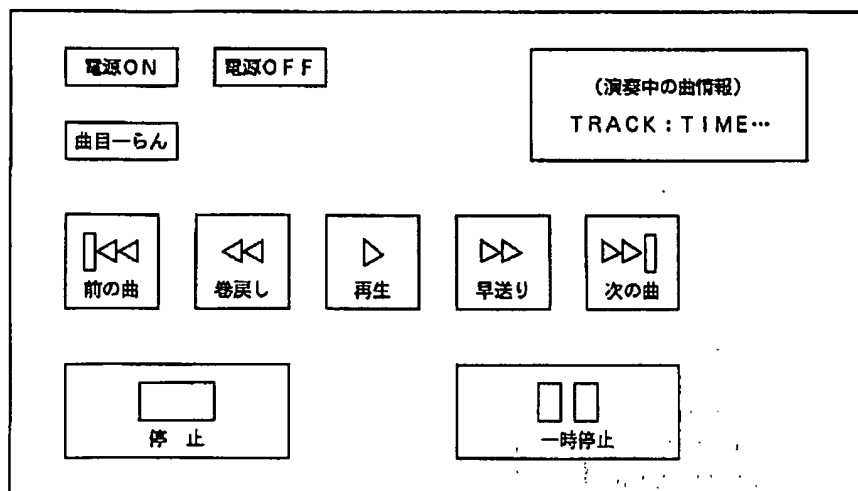
## [Drawing 26]



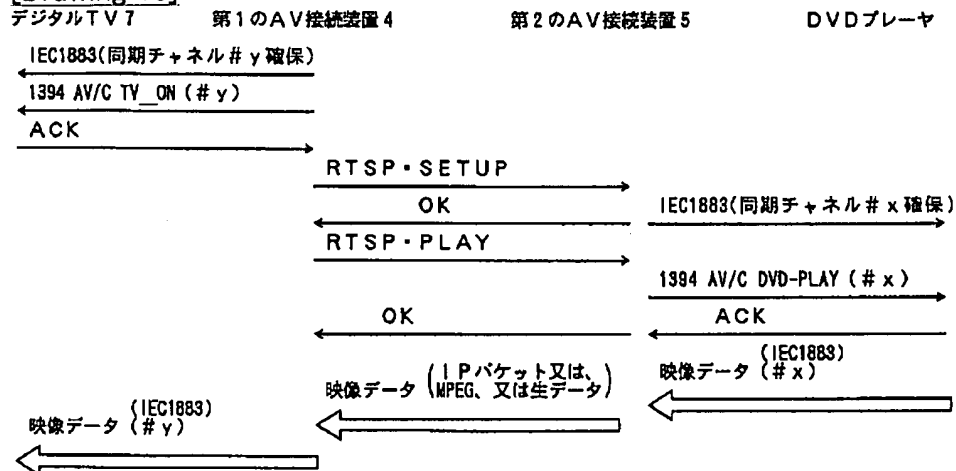
[Drawing 14]



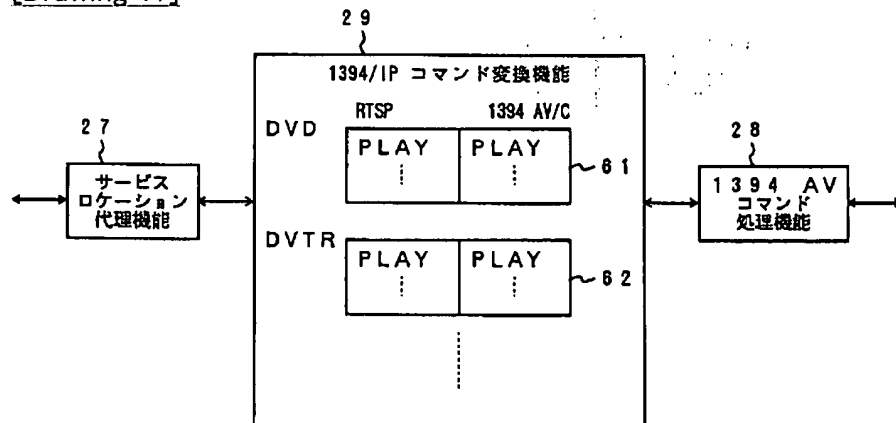
[Drawing 15]



[Drawing 16]

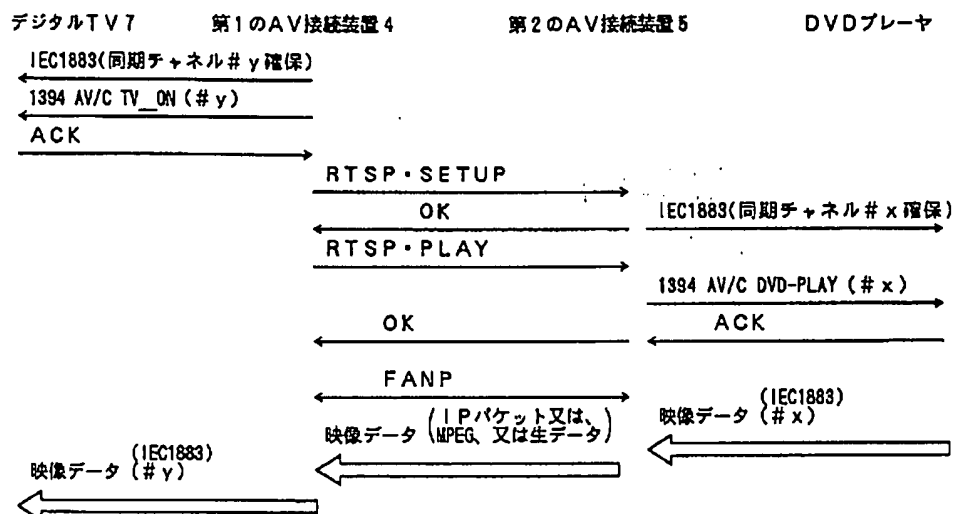


[Drawing 17]

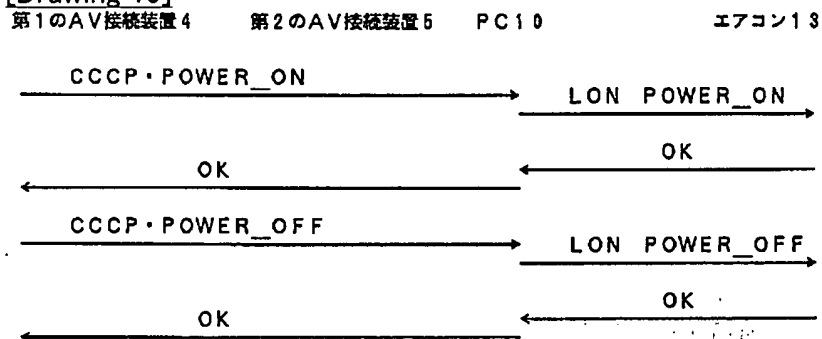


[Drawing 18]

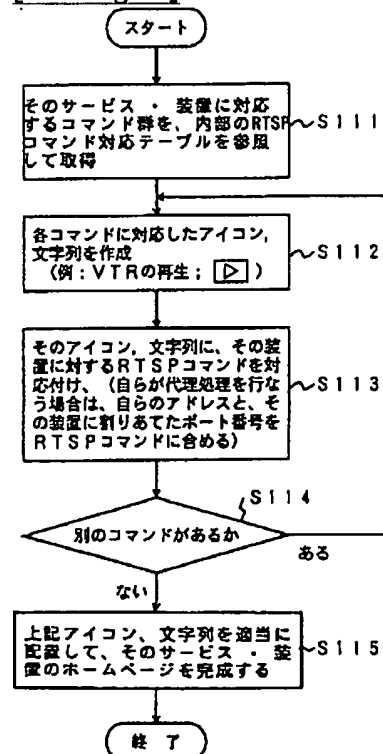




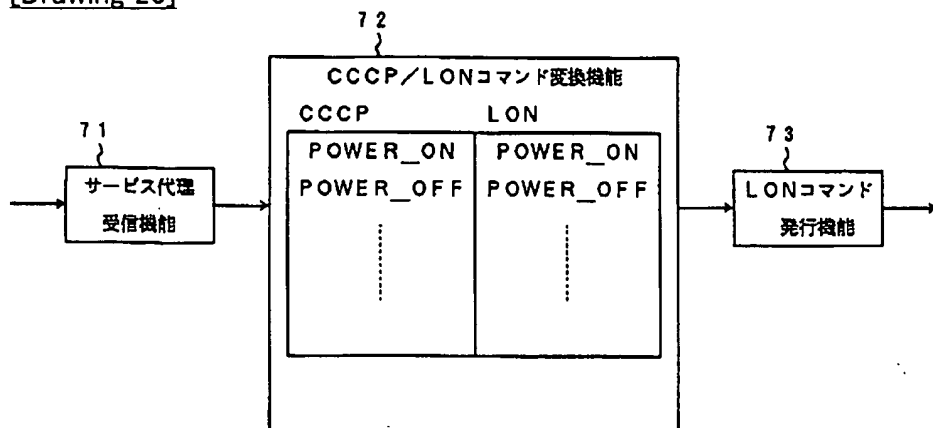
[Drawing 19]



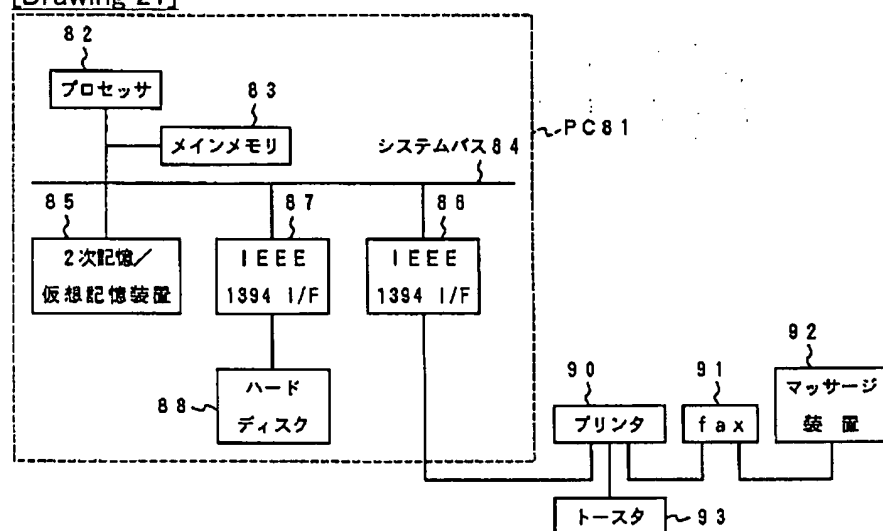
[Drawing 38]



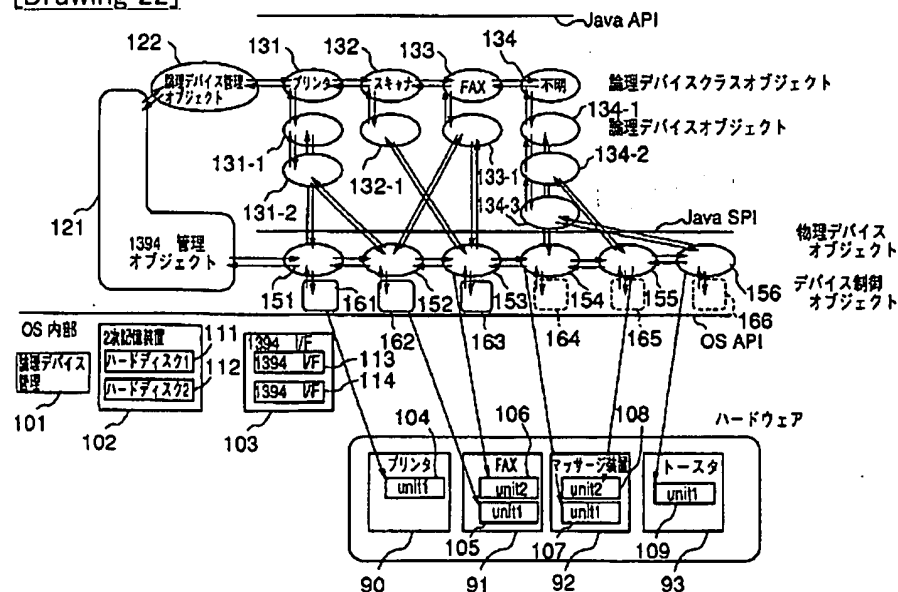
[Drawing 20]



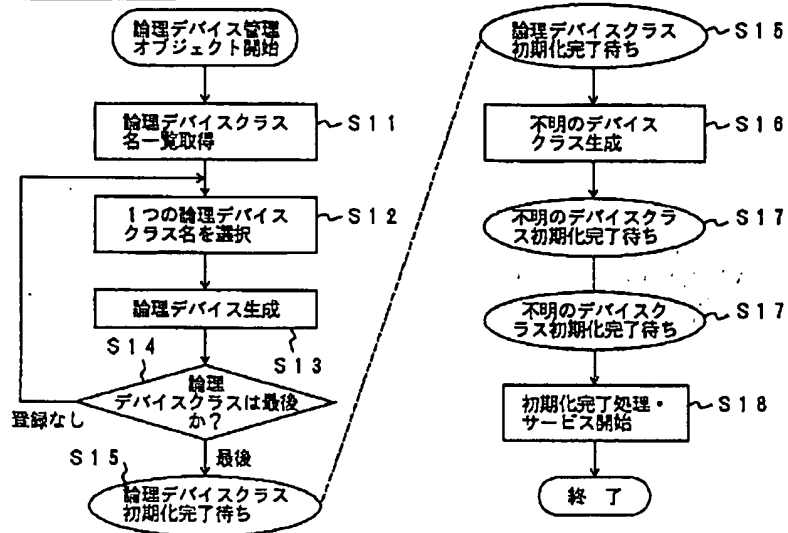
[Drawing 21]



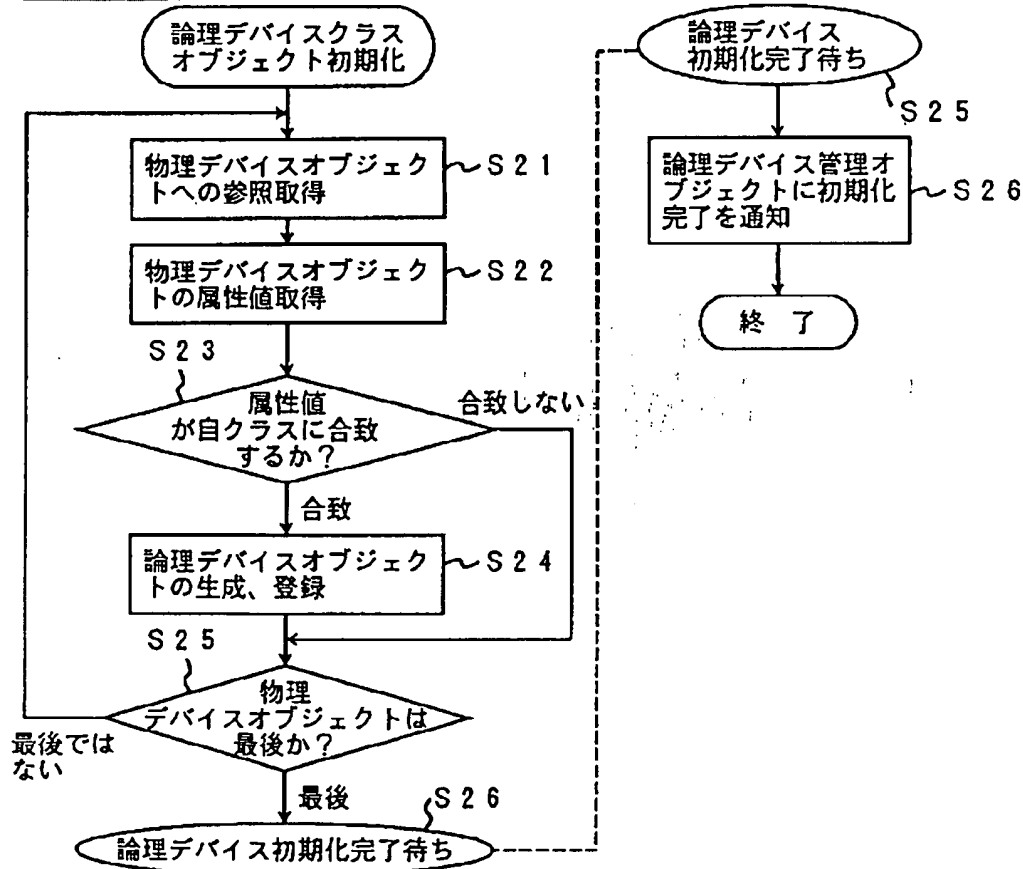
[Drawing 22]



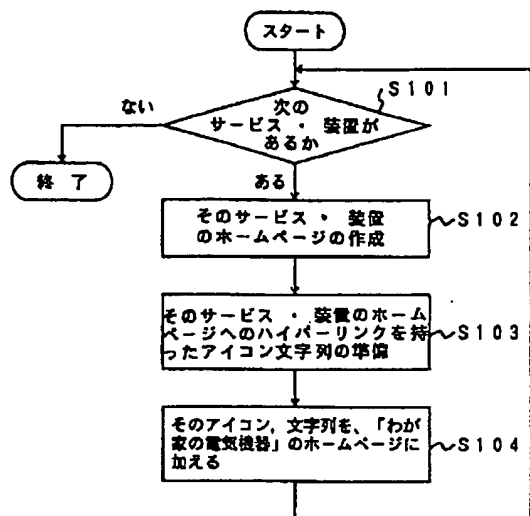
[Drawing 23]



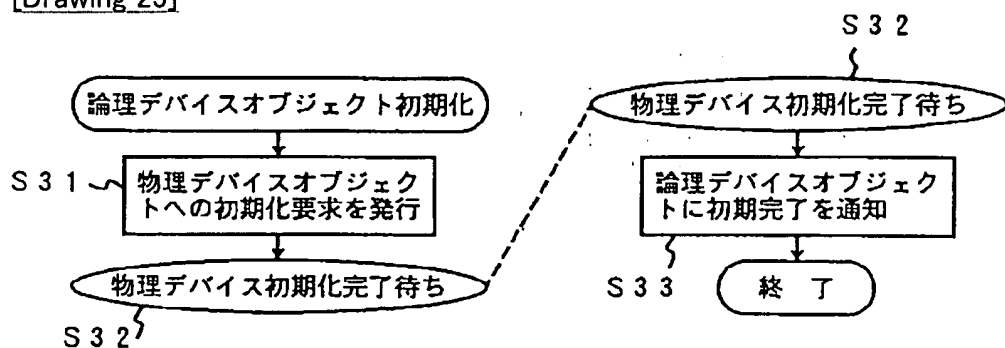
[Drawing 24]



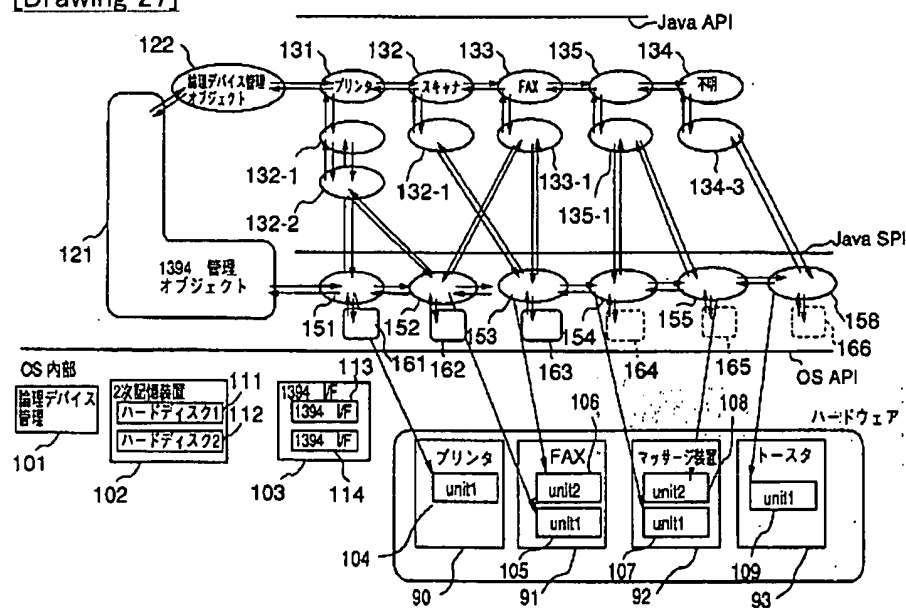
[Drawing 37]



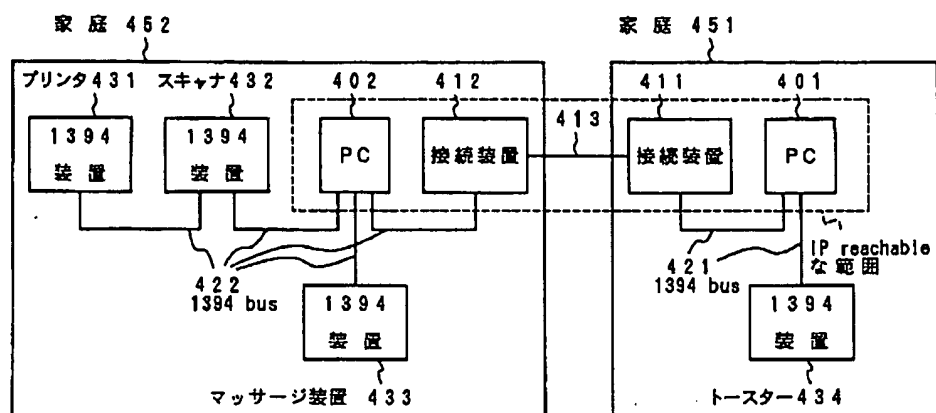
[Drawing 25]



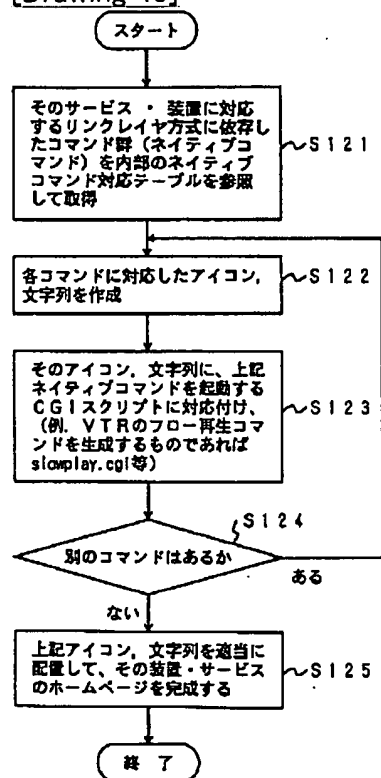
[Drawing 27]



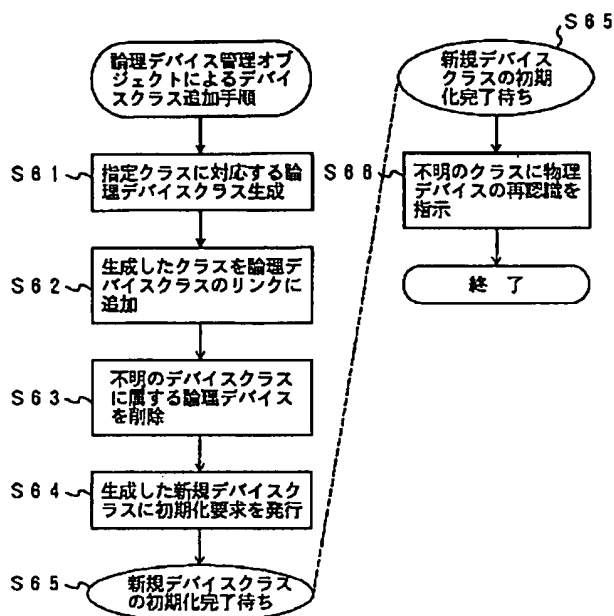
[Drawing 30]



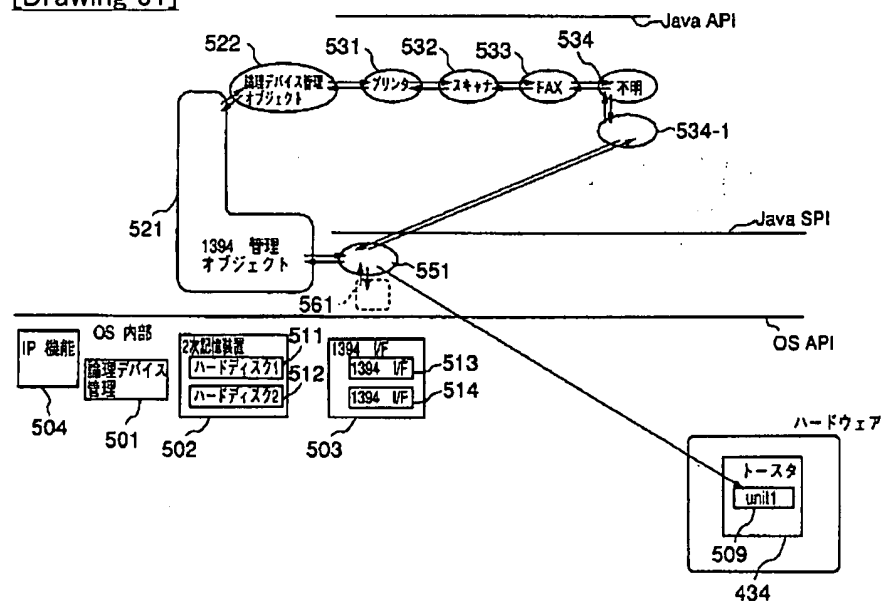
[Drawing 45]



[Drawing 29]



[Drawing 31]



[Drawing 50]

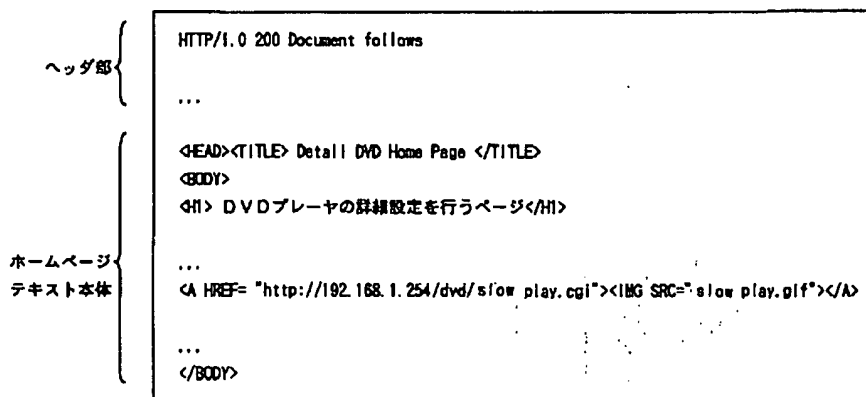
RTSPコマンド対応テーブル

	RTSPコマンド	1394AV/Cコマンド
DVDプレーヤ	PLAY (パラメータ)	PLAY (パラメータ)
	⋮	⋮
デジタルVTR	PLAY (パラメータ)	PLAY (パラメータ)
	⋮	⋮
⋮	⋮	⋮

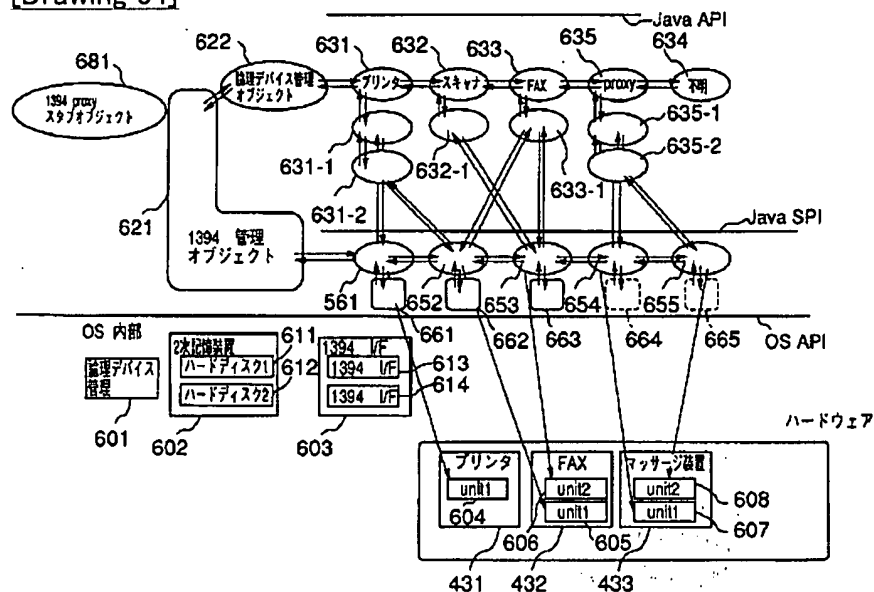
```

graph LR
    IP[IP端末  
(G.2)] --- N2([第2のネットワーク  
(インターネット)])
    N2 --- AV[AV接続装置  
(G1/P.254)]
    AV --- N1([第1のネットワーク  
(IEEE1394バス  
(ホームネットワーク))])
    N1 --- PC[PC  
(P.1)]
    N1 --- P[プリンタ  
(P.2)]
    N1 --- DVD[DVDプレーヤ  
(P.3)]
  
```

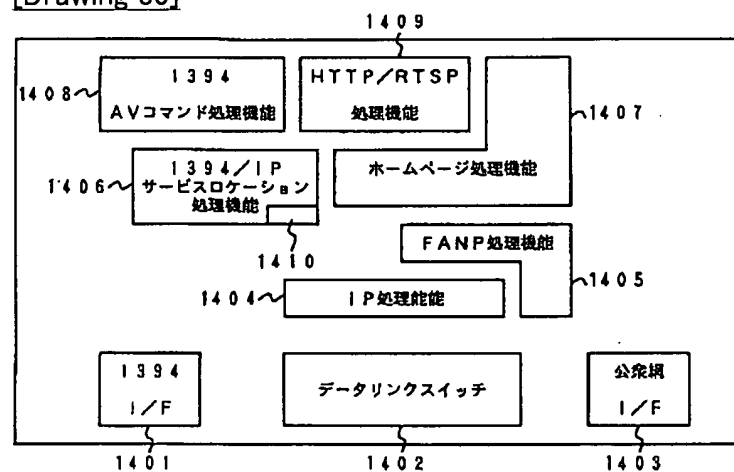
[Drawing 46]



[Drawing 34]

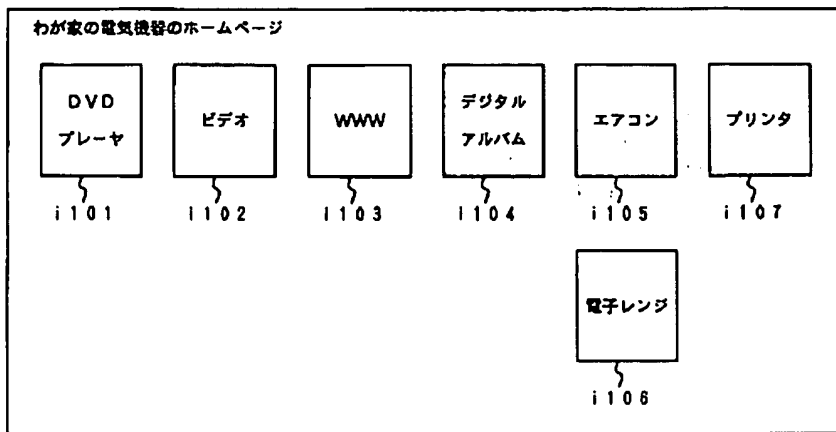


[Drawing 35]

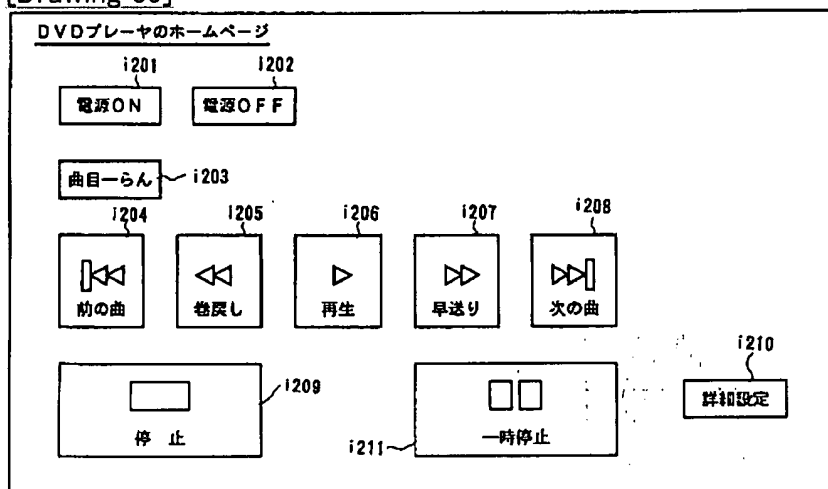


[Drawing 36]



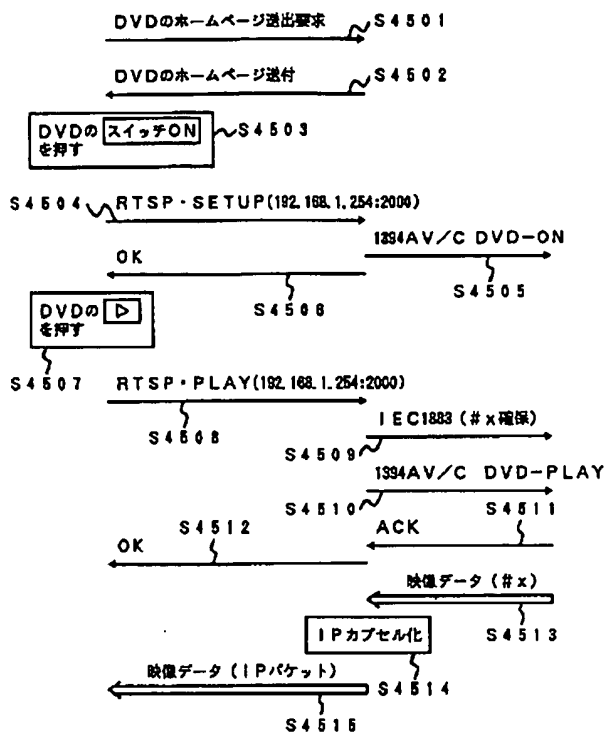


[Drawing 39]



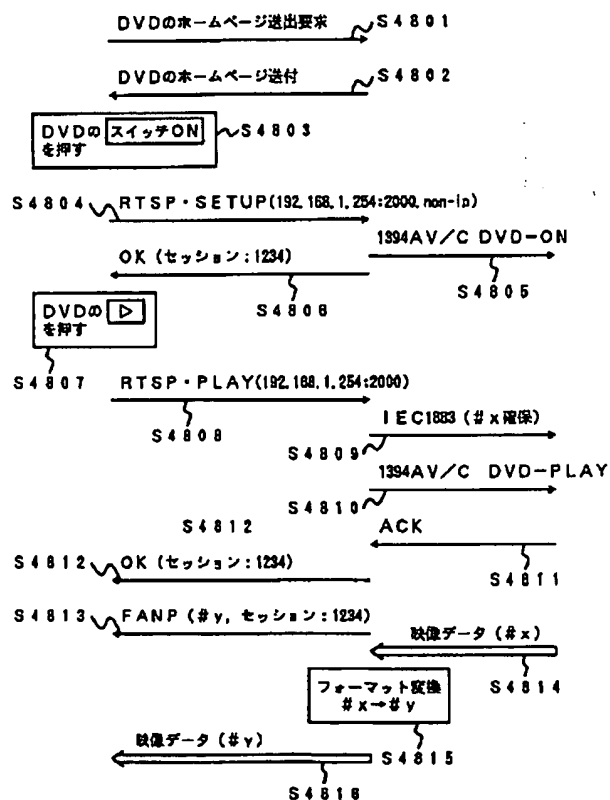
[Drawing 40]

第1のAV接続装置      第2のAV接続装置      DVDプレーヤ



[Drawing 43]

第1のAV接続装置      第2のAV接続装置      DVDプレーヤ

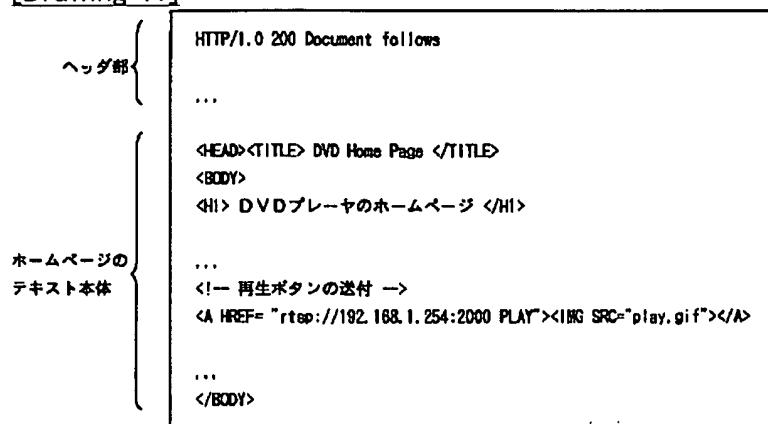


[Drawing 55]

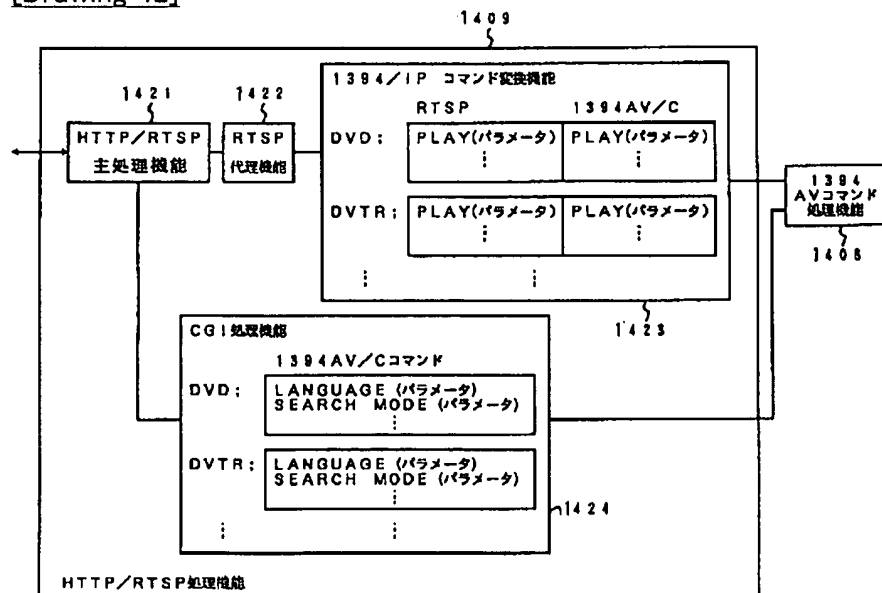
アドレス・ポート番号変換テーブル

インターネット側		ホームネットワーク側	
IPアドレス	第1のポート番号	IPアドレス	第2のポート番号
G.1	2000	G.3	80
G.1	2002	G.2	80
G.1	2004	G.1	80
⋮	⋮	⋮	⋮

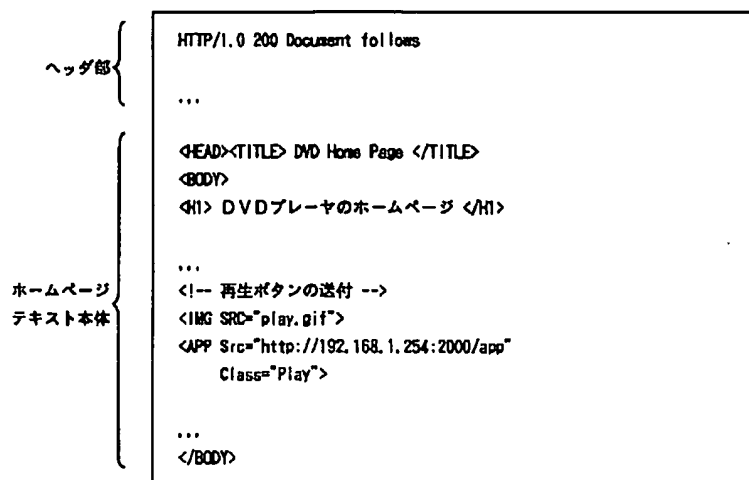
[Drawing 41]



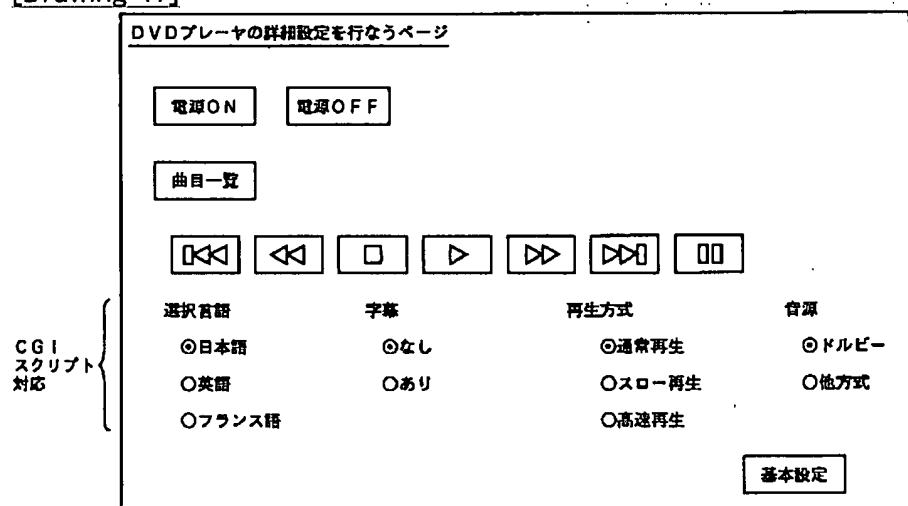
[Drawing 42]



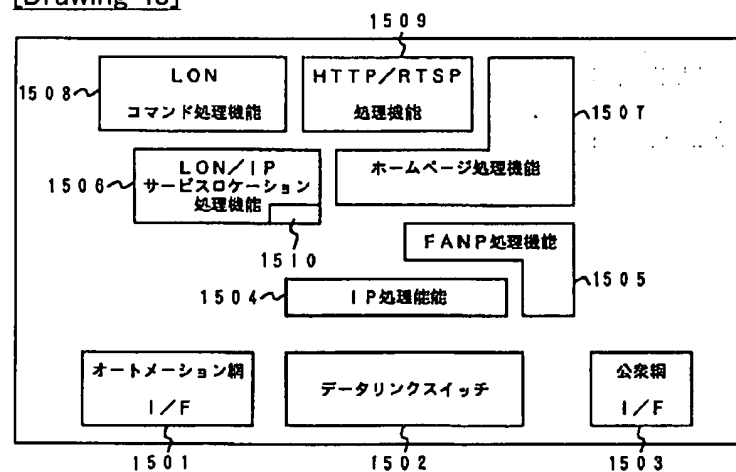
[Drawing 44]



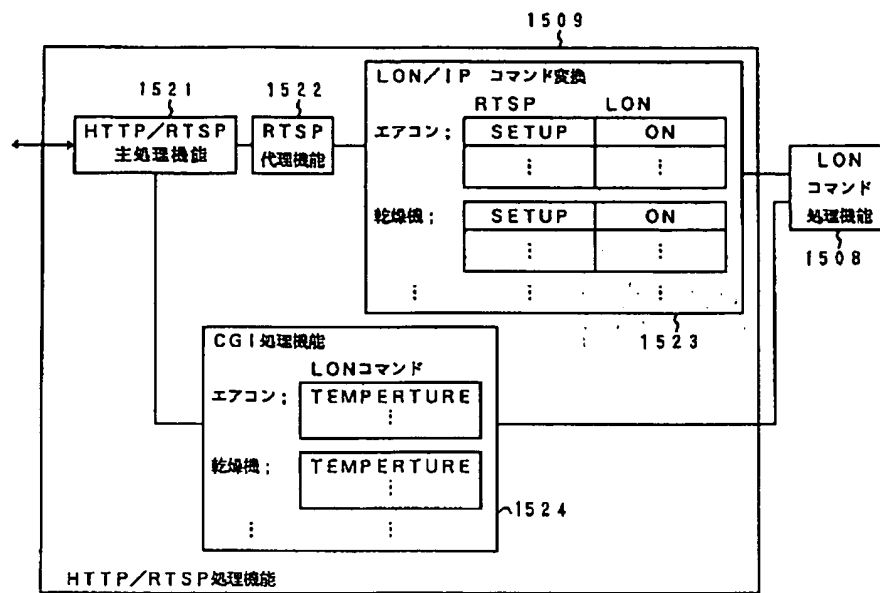
[Drawing 47]



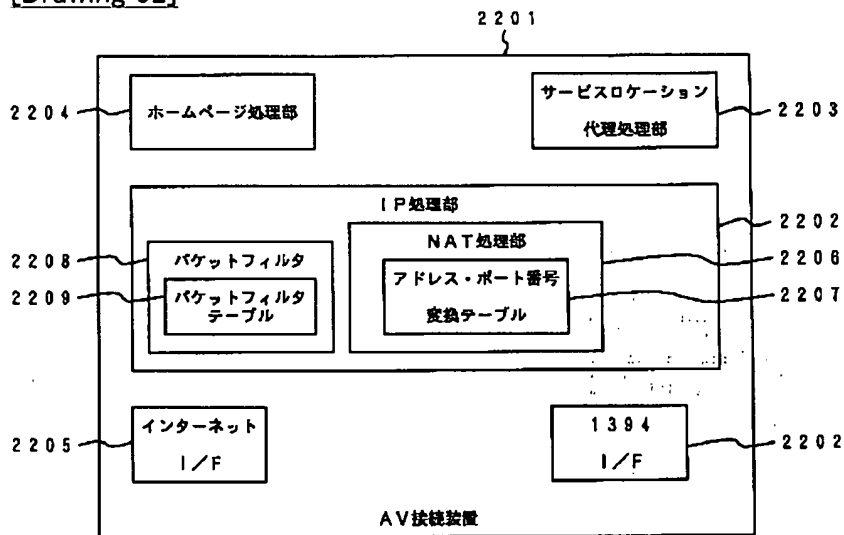
[Drawing 48]



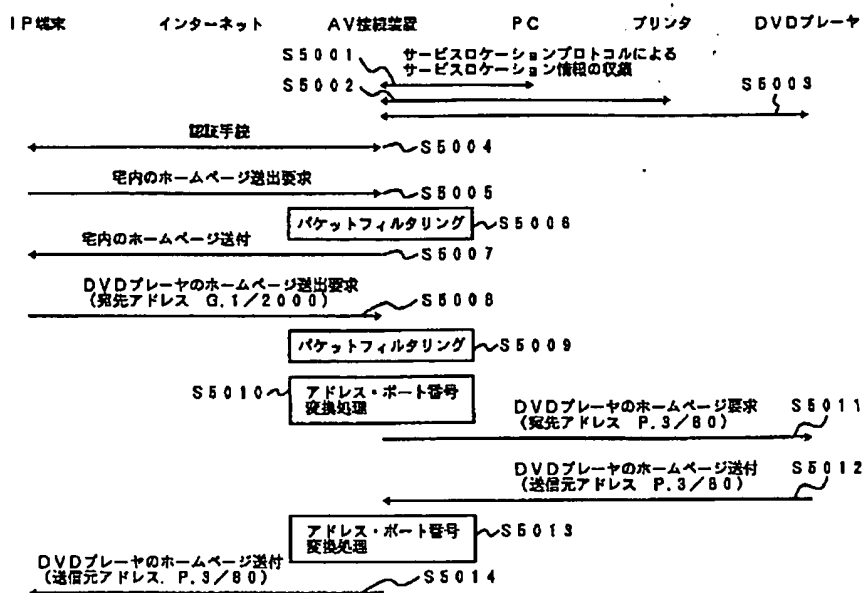
[Drawing 49]



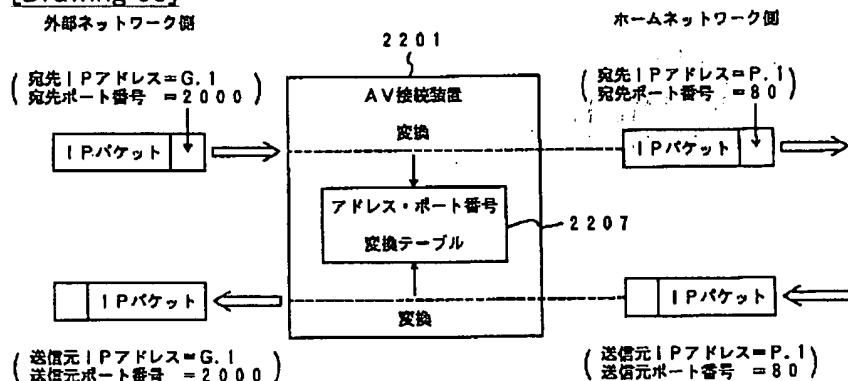
[Drawing 52]



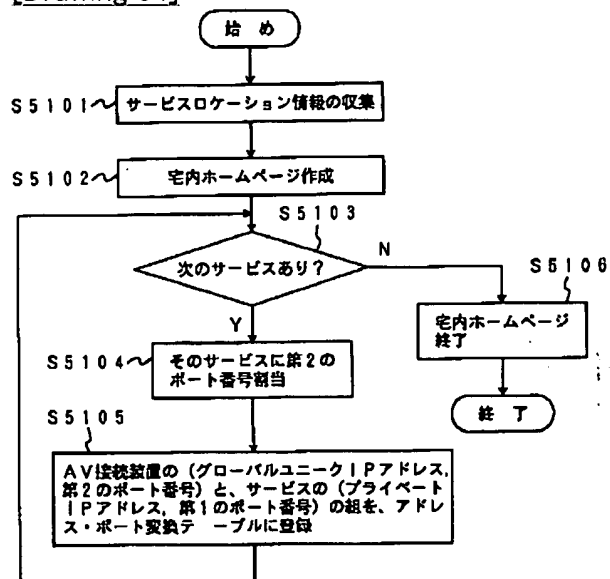
[Drawing 53]



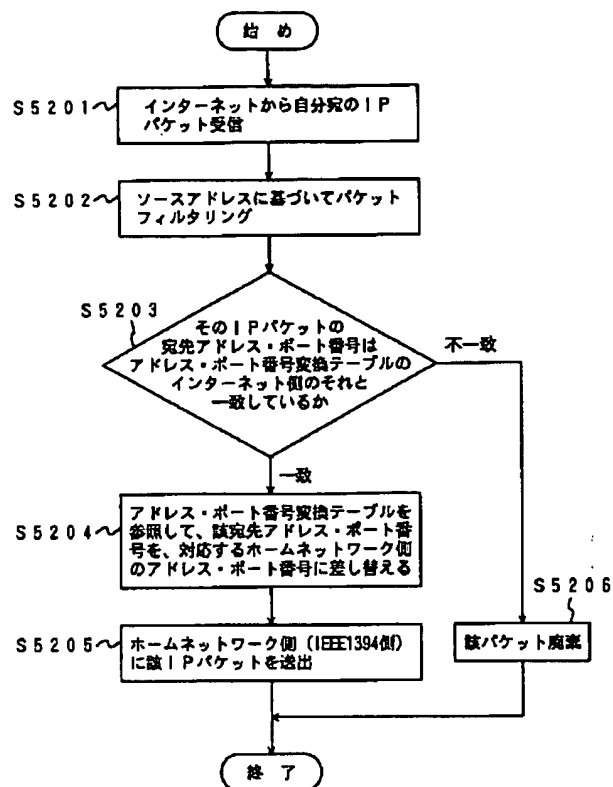
[Drawing 58]



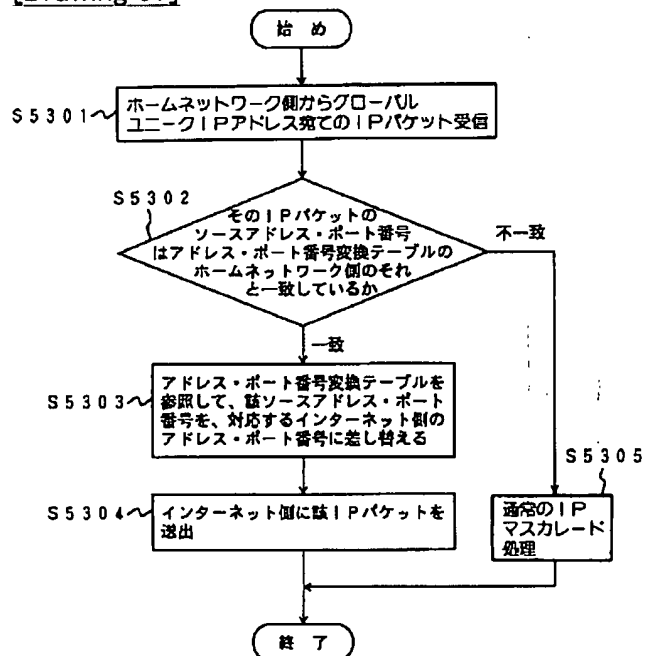
[Drawing 54]



[Drawing 56]

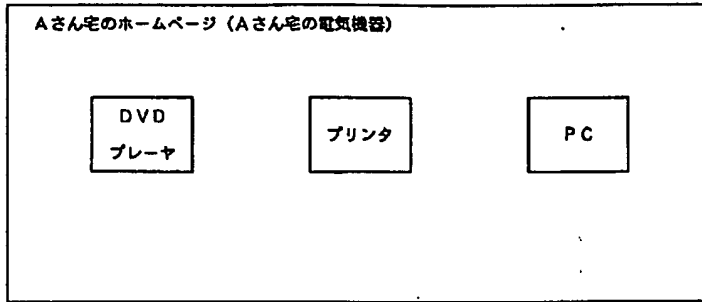


[Drawing 57]



[Drawing 59]

宅内ホームページ



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[Translation done.]